The American Transportation Problem

John Howe Peyton

Price 50 Cents

To All Who Favor Justice and Fair Play.

The American Transportation Problem

A STUDY OF

American Transportation Conditions

WITH A VIEW TO ASCERTAINING WHAT POLICY AMERICANS SHOULD ADOPT IN ORDER TO EFFECTIVELY MEET EXISTING CONDITIONS AND BE PREPARED TO CONTINUE TO LEAD THE NATIONS IN THE MARCH OF PROGRESS AND CIVILIZATION.

BY

John Howe Peyton

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INTRODUCTION

"Truth always dwells a long time with small minorities."—Francis Lieber.

"Truth is a good dog; but beware of barking too close to the heels of an error, lest you get your brains kicked out."—Coleridge.

The studies and investigations that led to the preparation of the following pages were undertaken at a time when the writer fully accepted the current theory that the improvement of some of our rivers might benefit the Nation. Like the great body of citizens, he had given no special attention to the subject, but he had casually read many of the articles, with which the magazines were overloaded, during the years 1906 and 1907; and though the extravagant statements made by most of the waterways advocates were manifestly absurd, yet he supposed that "where there was so much smoke there must be some fire." He fully realized, from the beginning of the discussion, the utter absurdity of attempting to make the Ohio, or any other large river, constantly navigable by means of re-forestation, or by building reservoirs to hold a portion of the run-off water of the wet season, in order to use it to increase the flow, and, thereby, produce a navigable depth during periods of low water.

The progress of his investigations brought many surprises, and, finally, an overwhelming conviction that the whole of the agitation for improving the inland waterways is based on prejudice against the railroads, and that the prevalence is made possible only because of the general lack of information, among our citizens, as to actual transportation conditions on the rivers and canals, as well as on the railroads.

The prejudice against the existing transportation facilities is due, in some measure, to abuses on the part of the transportation companies, and to the fact that some of the agents and employees of such companies are arrogant, or stupid, or boorish and uncivil—but it is due chiefly to widespread misapprehension and misrepresentation. The majority of us are captious by nature, and it is always easy to induce people to think evil of their neighbors or servants. Designing politicians, seeking preferment, are ever ready to take advantage of the

prevalence of this weakness of human nature, and space-writers for the newspapers and magazines are no less ready and eager to cater to any prejudice that may take hold upon the minds of the masses of the citizens. Both these forces were surprisingly active in the crusade against the transportation companies, during the last term of the Roosevelt administration, and they succeeded in stirring up much bitterness and hatred between different classes of society, and between the varying interests among the great body of citizens. The great majority of American men are honest, but a still larger proportion are readily misled by their prejudices, and, since the human race is gregarious, and only a few think for themselves, when a prejudice or error once takes firm hold upon the minds of men, they are ready, like a herd of buffalo, to charge blindly and madly in any direction, until they are brought up sharply, by encountering a stone wall or a precipice.

Carlyle said of his own country: "There are twenty-seven million people in Great Britain, most of whom are fools." What shall we think of the denizens of our own great country, in view of the follies to which we have recently been giving ourselves?

If the manner in which the subject has been treated shall seem open to the objection that it is **ex parte**, the writer can only admit that such is the case, and say that it is necessarily so, since there is really only one side to the question. If one were called upon to discuss the truth or falsity of the statement of the fool, that "There is no God," his whole argument must, of necessity, be **ex parte**. A negro preacher, living in Richmond, Va., maintained, from his pulpit, for many years, that "The sun do move." A discussion of that proposition must also, of necessity, become distinctly **ex parte**.

The fact that a theory is popular, does by no means prove that it is true; indeed, the history of the human race shows that error is usually, for a time, more popular than truth, and that, though truth must always ultimately prevail, yet usually its popular acceptance is the result of a hard and bitter fight on the part of its adherents.

The writer has little hope that the result of his investigations will have any considerable effect in modifying the popular craze for inland waterways, but he feels sure that calm investigation will lead thoughtful men to take the same view of the matter that he has been forced to take; and he is confident that such investigations will eventually be made and will lead to the abandonment of nearly all the inland waterways schemes, after a few more millions, or scores of millions, have been wasted thereon.

Preface to Second Edition.

Since the appearance of the first edition of the "Transportation Problem," much additional information has been obtained, as to actual experience in navigating Inland Waterways in America, and, that edition being exhausted, the book has been revised, some errors corrected, and a small portion of the new data incorporated.

The writer has now, in his possession, a large mass of additional data—all of it alike in general character, and all confirming him in the conviction that commercial navigation of American Inland Waterways is economically impossible—no matter how many hundreds of millions of dollars may be expended on their improvement.

There is no possible way to restore commerce to the waterways, except by radical legislation, forbidding the citizens from shipping their goods by rail; and it is inconceivable that prejudice can ever carry the American people to that extremity of folly. Only a small part of the data collected has been included in this edition, and it is feared that even that will prove so wearisome, in its sameness, that very few readers will wade through the monotonous record of our failures to induce shippers to use the slow, primitive, inconvenient, circuitous and costly water routes, when they have the safe, modern, commodious, direct and economical railroads at their doors.

Butte, Montana,
November, 1909.

Chapter I.

THE RELATION BETWEEN TRANSPORTATION AND WORLD PROGRESS.

"Commerce is King."—Carlyle.

The surface of the earth and the portion of the outer crust thereof, of which we have knowledge, present to view innumerable diversities of latent wealth. No two things are precisely alike and from no two portions of the earth's surface or crust can our labor produce precisely the same kind of wealth.

Man, in his primitive condition, was satisfied with the products of the limited region within which he was born and could roam, but as he gained knowledge of the earth's diversified wealth his needs gradually increased. We desire everything that we have found to be good and that experience has shown to be obtainable. Increasing knowledge as to the kinds of wealth that may be produced by our labor from different soils, under different climatic conditions, and from the ores found in different portions of the earth's crust, leads to the exchange of products, or commerce, between individuals, families, tribes, states and empires. Throughout the known history of the human race the wealth and material prosperity of man has ever been advanced or retarded in proportion to his facilities for marketing the products of his labor and exchanging them for the products of the labor of other men. Since our race advanced beyond its most primitive condition the great problem of the ages, so far as material progress is concerned, has been the cheapening and facilitating of travel and transportation, in the interests of commerce between peoples dwelling on different portions of the earth's surface and every important invention or discovery that has quickened or cheapened travel and transportation has marked a new era in human progress. No thinking man will dispute the truth of the two following propositions:

First. A State or Nation may prosper and its people grow rich and powerful, though the soil of their country be poor, though there be present no great mineral deposits, and even though the climate be cold

and bleak, **if they have at command ample and economic facilities for marketing the products of their labor and exchanging them for those of other peoples.** The present condition of the New England States proves this. Five of those little states have a great length of sea coast, with deep and safe harbors. This made it possible for the energy and courage of the inhabitants to achieve success and produce immense wealth, though the soil is poor, the climate cold, and though there is comparatively little mineral or other local wealth to be developed. From the beginning of her history New England has had the best known transportation facilities; consequently her wealth has increased immensely. Ships could bring raw materials into her harbors and take away the finished products of factories. With an area of only 62,000 square miles, the New England States now have a population of over 6,000,000, and an aggregate wealth of over $10,000,000,000. Three of the states (Massachusetts, Rhode Island and Connecticut), with an aggregate area of only 14,294 square miles, have a population of nearly 5,000,000, whilst the immense inland State, Minnesota, in the same latitude, with the richest iron ore deposits known to exist in the world, with a vast fertile wheat-growing territory, and with an area six times as great (83,365 square miles), has now a population of only about 2,000,000 (1,751,394, according to the census of 1900) and was an almost unknown territory until railroads were extended within her borders and she was thereby put in communication with the great world of progress.

Second. A State or Nation having immeasurable natural wealth of soil, mine, forest, quarry and water power, with strong, intelligent and courageous inhabitants, cannot prosper greatly, cannot grow rich and powerful, **unless it be supplied with ample economical facilities for marketing its products and exchanging them for those of other peoples.** Innumerable proofs of the truth of this second statement may be cited; the slow development of the interior of all countries of great area, before the era of railroads; the practically savage condition of the inhabitants of the interior of Europe, Asia and Africa during the centuries in which Tyre, Carthage, Greece, Rome, Alexandria and Venice flourished on their coasts; the slow development of our own inland territory during the period of nearly three and one-half centuries that elapsed between the discovery of America and the application of steam power to overland transportation. In recent years rough mountain coal lands in Western Pennsylvania, situated close to the Pennsylvania and other railroads, have sold for over $1,200.00 per acre. Land under-

laid with the same quality of coal, in even greater quantities, situated in Eastern Kentucky, far from railroads, has, in the last few years, been sold for $5.00 and is now valued at from $25.00 to $50.00 per acre. Before railroads were extended west of the Mississippi River, corn sold for ten cents a bushel in Missouri, and was often used as fuel for cooking and heating. With railroad transportation, corn now sells in Kansas City at seventy-five cents a bushel, and every home may be supplied with cheap coal or other fuel hauled by rail from distant regions. Before railroads entered portions of Eastern Kentucky and Tennessee I often saw large walnut logs in that territory burned in heaps, with other logs, to clear the land. Recently, one walnut tree, taken from a point near the new Louisville & Nashville Railroad line in Eastern Kentucky, sold for $500.00. It is useless to multiply proofs in support of the assertion that, **The progress and prosperity of a Nation depend absolutely upon the nature of its transportation facilities.** It is, therefore, of paramount importance that the statesmen of a Nation should ascertain the best possible means for transporting the products of its people and then do all that they can to encourage the development of those means.

Before the era of railroads, George Washington and other great statesmen fully realized these truths and vigorously advocated the construction of inland canals, because such avenues of traffic were superior to any other then known. The small canal boat drawn by mules or horses, was, in the days of Washington, the quickest and most economical means of inland transportation, and such being the case he, true statesman and patriot, earnestly advocated the building of canals.

For long ages transportation by water had been quicker and cheaper than by any known means of overland carriage. The inevitable result was that the seats of great empires had always been on the shores of navigable waters. A little cluster of islands, off the Western coast of Europe, became the center of the greatest empire of the Nineteenth Century. Britain became great because, being "Mistress of the Seas," she controlled, in a large measure, the only means of world-wide international and inter-continental transportation.

Until recent times, the human race, having its habitation on land, was forced to conduct its commerce on water. Navigable water being accessible to the inhabitants of only a small portion of the earth's surface, and the exchange of land products by means of water transportation being impracticable, except within the narrow territory bordering the waters, the progress of the Nations was slow, and the natural

wealth of the greater part of the earth remained undeveloped and unknown.

America was discovered four hundred and seventeen years ago. During more than three centuries her population was confined, chiefly, to a narrow territory along the sea coast and along such of her rivers as were navigable by the light-draught sailing vessels and oar boats used by our ancestors. Painful efforts were made to increase the scope of water transportation by digging costly canals, but in 1827, three hundred and thirty-five years after Columbus discovered the New World, the population of the United States was only 12,866,000, and the greater part of the Continent was still an unexplored wilderness or desert, inhabited only by wild animals and wandering tribes of savages.

In 1807, Fulton succeeded in propelling a boat by steam power, and within a few years a rapid resulting development was in progress along the banks of some of our great rivers, but it was necessarily confined to their borders. Our greatest rivers flow from North to South, across the direction of the world's traffic movement. They reach only a very limited proportion of the area of our country. The wealth of the human family is produced on land, and in order to move it by water it must first be conveyed by other means to the edge of the water and there trans-shipped. The same costly and laborious process must be repeated when it has been carried by water to the port nearest to its ultimate destination. Therefore, though the application of steam to water transportation made possible a great advance along the banks of the rivers, still National progress was retarded because water transportation is poorly adapted to the uses of beings who live and produce wealth on land.

In the year 1827, steam was successfully applied to locomotion on land. The frictional resistance to such movement was, in a large measure, eliminated by having smooth iron wheels move on smooth iron straps, fastened to wooden sleepers.

The building of railroads solved the transportation problem of the ages. Cities and Nations were no longer dependent upon transportation by water, but could grow and develop anywhere and exchange their products and manufactured articles with the inhabitants of other cities and countries. A tremendous development began at once. Our government adopted the wise policy of encouraging the investment of capital in railroad building. Within a lifetime the population of our country has grown seven times as much as it had in three hundred and thirty-five years before, and our wealth has become stupendous.

When railroad building began many of the European Nations were already hampered by immense investments in canals and canalized rivers and in boats, barges and ships adapted to inland water transportation. Great cities, industrial and manufacturing plants, had already grown up along the canals and rivers. Railroad building began also in Europe, but it soon became evident that the overland rail lines could afford vastly quicker, better and more economical transportation than the canals and rivers; that rail lines could be built to reach any territory by direct routes; and that slow movement of freight on the crooked waterways must be abandoned if the railroads should be allowed free course of development. The folly of it seems almost incredible, but it is, nevertheless, a fact that most of the European governments, acting under the influence of vested interests located along the waterways, undertook to curb and hamper railroad development in order to protect such vested interests. Arbitrary laws were enacted that forbade the railroads' carrying freight at rates that would compete with traffic on the canals and rivers. The policy of forcing the railways to become mere feeders to the rivers and canals was adopted in France, Germany, Russia, Austria and elsewhere. Consequently, railroad construction and improvement languished. About the middle of the Nineteenth Century an effort was made in Pennsylvania and in New York to restrict railroad transportation in the interests of the canals that had been built, but the strong common sense of the American people made it easy to defeat the selfish policy of a few great coast cities, and the development of the whole of our great territory went on unchecked. In 1869, Germany adopted the policy of State ownership of railroads. Forty years have elapsed since that blunder was made. In those years only 15,030 miles of railroad have been built in the German Empire, whilst more than 150,000 miles have been built in the United States. The freight cars on German railroads are, even now, little ten to fifteen-ton boxes, whilst American freight cars, of modern manufacture, are built to carry loads of fifty tons or more. Since 1882, more than 95 per cent of the increase in German population has been confined to cities of over 5,000 population, located on the shores of natural or artificial waterways, whilst the population of the United States has spread out over tremendous inland areas, which have increased in value by thousands of millions of dollars. During that twenty-five-year period Germany increased her exports by 421 million dollars, whilst the United States increased hers by 1,351 millions. During the same twenty-five-year period the public debt of Germany in-

creased over 1100 per cent, whilst that of the United States increased only seven per cent. During the same period the United States has advanced from a position of insignificance to that of the richest and most powerful Nation that the world has ever known, whilst the European Nations are stagnating and dwindling in relative power and importance.

Until within the past decade no serious effort was made, in the United States (except during the brief period of hysteria already referred to—notable chiefly in New York and Pennsylvania), to interfere with or hamper commerce and the natural development of the most economical and efficient transportation system yet devised by man. In the following pages we shall have much to say about the wild and impracticable schemes for regulating commerce and interfering with the natural development of trade and transportation, into which misguided enthusiasts, impractical doctrinaires and ambitious politicians have, in recent years, been attempting, not without some measure of temporary success, to rush both the National and State governments.

Chapter II.

THE VEINS AND ARTERIES OF THE BODY POLITIC.

"The blood thereof, which is the life thereof."

Lines of transportation are to the Nation what the veins and arteries are to the human body. The blood is essential to the life of the body. When its natural circulation is impeded or clogged, or interfered with, disease results. When the blood stagnates in the veins, growth and development become impossible and death approaches. The wealth of a Nation is the blood thereof, and its free, natural, unimpeded circulation is absolutely essential to healthy growth and development. No rational man will attempt to interfere with or regulate the natural circulation of the blood in his veins; no wisely governed Nation will attempt to interfere with or regulate the circulation of its wealth along natural lines of trade and transportation. The progress of China, with its vast population, was stopped for centuries by laws prohibiting intercourse and traffic with other Nations. The progress of Germany, France, Austria and Russia has been greatly impeded by laws regulating railroad rates in the interests of primitive and antiquated canal and river transportation. Growth and development in the interior of Australia have been paralyzed by laws regulating railroad rates, in the interest of the coast towns. The rate of progress of development in the United States has been astounding. Until recently, our government wisely refrained from attempting to interfere with or regulate the free exchange of commodities, i. e., the natural circulation of the life blood of the Nation. The transportation agencies were encouraged to the utmost possible development. The **laissez faire** principle was applied to traffic and transportation throughout the National domain. The wisdom of the policy pursued by our government, previous to the recent era of the "Big Stick" and "Government-by-Commissions," may be more fully appreciated when contrasted with the folly of the opposite course as pursued in Europe. A profound English thinker and historian, referring to this subject, has said:

"Among the accessories of modern civilization, there is none of greater moment than trade, the spread of which has probably done

more than any other single agency to increase the comfort and happiness of man. But every European government which has legislated much respecting trade, has acted as if its main object was to suppress and ruin the traders. Instead of leaving the National industry to take its own course, it has been troubled by an interminable series of regulations, all intended for its good and all inflicting serious harm. To such an height has this been carried, that the economical reforms which have distinguished England during the last twenty years have solely consisted in undoing this marvelous and intrusive legislation. * * * In every quarter and at every moment the hand of Government was felt. Duties on importations and duties on exportations; bounties to raise up a losing trade, and taxes to pull down a remunerative one; this branch of industry forbidden, and that branch of industry encouraged. * * * Then, too, we find laws to regulate wages; laws to regulate prices; laws to regulate profits; laws to regulate the interest of money. * * * A system was organized and strictly enforced, of interference with markets; interference with manufactures; interference with machinery; interference even with shops, etc., etc. * * * While that absurdity might be carried to its extreme height, a large part of all this was by way of protection; that is to say, the money was avowedly raised, and the inconvenience suffered, not for the use of the Government, but for the benefit of the people; in other words, the industrious classes were robbed in order that industry might thrive." (See Buckle's History of Civilization.)

Let the reader remember that the above scathing criticism refers to conditions in Europe many years ago, and not to conditions recently inaugurated in the United States, during the unspeakable era of the "Big Stick" and government through meddling commissions appointed by the President.

Whilst the progress of civilization was being thus retarded or paralyzed in Europe, Australia and South America, by meddling legislatures and by government interference with the flow of the life blood of the Nations, the United States was advancing at a rate of progress wholly without parallel in the previous history of the world. Trade and transportation were unhampered by restrictive legislation.

The opportunities thus afforded attracted men of tremendous force of intellect and character. Such men created or became the managers of great industries and magnificent enterprises for providing the Nation with constantly improving transportation facilities. Free competition was the governing principle, and nature's law, the "survival of the fittest," brought to the helm men of a type that, in other Nations and ages, have guided and commanded great armies, and made the destruction of life and property their chief glory.

These men, splendid in their intellectual power, courage and energy, studied the natural wealth of the Continent, studied the markets of the world, studied the topography of the country. They put engineers and scientists and laborers to work by thousands and tens of thousands, building lines of transportation over which the products of the Nation might be conveyed to the markets of the world, under rates and regulations that were better adapted to encourage the development of the wealth of the whole Continent than any others that have been devised by man.

The Nation was governed by statesmen who were broad enough to recognize their own limitations; who did recognize the ability of the great Captains of Industry and Generals of Transportation and left them unhampered in their mighty work. Thus encouraged, the great Empire builders labored and fought. They conquered the adverse forces of nature and brought them into subjection, and they accomplished the still more difficult labor of controlling and directing the armies of workers who were organized, trained and made effective by the genius of such commanders. Within a lifetime this Nation leaped forward from a condition of isolated insignificance, with a narrow fringe of towns and villages along her coasts, bordering a vast solitary wilderness, to leadership among the Nations of the earth; to an unprecedented state of wealth and material prosperity, with the whole of a vast territory pushing forward to yet greater magnificence.

After three and a half centuries without inland transportation facilities, our territory had only 13,000,000 inhabitants. Within a lifetime after the application of steam to overland carriage, the people being free and unhampered in the development of means and methods of trade and traffic, we have a population of 90,000,000 spread out over vast reaches of inland hills, valleys, plains and mountains. The whole Nation is in touch with the great world of progress. The railroad and a wise National policy of non-interference with commerce, made it possible for an industrious, liberty-loving people, guided by great Industrial Commanders, to accomplish these miracles.

Why has this stupendous growth of population and extension of trade been accomplished in the United States, whilst in South America there has been, during the same period, stagnation and degeneracy, and in Australia little progress? The reason is clear enough, and has already been mentioned. With us, during the first 125 years of our history, the citizens would not permit their law-makers to interfere with trade or hamper it by foolish restrictive legislation. Neither was lib-

erty of action seriously impeded by tyrannical labor organizations or "Unions" among the workers themselves. Men of all classes were free to work where, when and how they chose, so long as they committed no crimes against their fellows. These conditions stimulated personal ambition, encouraged the development of courage, energy and persistence, and left every individual free to make the best possible use that he could devise of the opportunities presented by the opening up to him of the markets of the world, and the stupendous resources of his own country. It impelled strong men, unhampered by fear of "regulation" or paternalism, to risk life, fortune and reputation in exploiting vast schemes for conquering the difficulties of nature, for bringing to the markets of the Nation the minerals and forest products of remote mountain regions, and the agricultural products of fertile valleys and wide plains, lying hundreds and even thousands of miles from the centers of population. Ambition was the motive power; freedom from fear of unjust government interference or "regulation" was the stimulus and tonic; railway transportation furnished the means; success, quick in accomplishment and astounding in measure and degree, has been the result.

Other vast Continents were discovered at about the same time that ours was, but in South America and even in Australia, forms of government were established in which liberty of action was hampered, and the incentives to personal effort and initiative were deadened because of a constant interference with trade and transportation by royal commissions sent out to "investigate" conditions and "regulate" industry and traffic. Such commissioners, like those appointed by our last President, were usually ignorant of the causes of the conditions, with which they attempted to deal, and they were always irresponsible for the results of their foolish efforts to interfere with the natural flow of the life blood of the provinces. The effect of all this is seen in the stagnation and inaction of the Nations dwelling on those Continents.

One hundred and fifty years ago this country was also suffering from the effects of too much "regulation." Business and physical development were fearfully hampered because of senseless interference by irresponsible "commissions" from the mother country. Our ancestors rose up, manlike, and thrust all that aside. "Taxation without Representation" was a brutal injustice, and could not be tolerated by brave and true men.

We Americans justly applaud the courage and heroism of our ancestors of the Revolutionary War, because they defied the British Nation

to force upon them "Taxation without Representation," and at the same moment, great multitudes of our people have been also applauding the appointment of commissions and the enacting of laws designed to **regulate** the affairs of great industrial enterprises, without a particle of responsibility for the effects or results of such regulation. Is not "Regulation without Responsibility" but another phase of "Taxation without Representation"? Is it any less a brutal injustice to confiscate or ruin the properties of our fellow citizens than it was to exact revenue from the inhabitants of a distant province, without allowing them a voice in the matter?

Legislative or executive interference with industry, trade, commerce or transportation, has always been, and must ever continue to be, utterly ruinous. The suicidal folly of such "regulation" has been demonstrated wherever it has been attempted throughout the history of civilization, and the almost miraculous material progress and prosperity of this Nation was only possible because such things were not attempted by our Government, until, in an evil moment of misguided popular emotionalism, we placed in the executive mansion the first President that ever presumed to assert his own individual superiority to the Constitution and laws of the land.

It is astounding that such a man should still be a popular hero, in the face of the fact that his efforts at "regulation," his intrusive folly, his interference with trade and transportation, with industry and social order, with agriculture and even with public morals and religion, brought the Nation to the brink of ruin, at a time when it would otherwise have been more prosperous than ever before in its history. This man, whom multitudes still applaud, not only interfered with the natural laws of Commerce and Transportation, and thereby became the chief cause of the precipitation of a financial panic, in the midst of an era of phenomenal prosperity, but even assumed authority to appoint "Commissioners to devise means and methods for regulating and reversing the physical laws of the Universe."

Even this incredible folly was applauded by multitudes of Americans, and the impracticable and impossible "Roosevelt Policies" are still popular among the people of portions of the Nation.

"Whom the Gods would destroy, they first make mad." Multitudes of the citizens of this Nation seemed utterly mad whilst under the dominance of the last President, but we are optimistic. The "Roosevelt Policies" are but phenomena of a transient craze. Our wisest leaders, and great numbers of our conservative citizens, never

gave their assent to those follies, though only a few men of heroic mould had the courage to boldly denounce and openly oppose them, when they were most popular.

Now, many men are raising their voices in protest, and the Chief Executive of the Nation, tactful, prudent and politic, limits his expressions of approval of Roosevelt's mad schemes by such expressions as "so far as may be lawful," "so far as may be found practicable," knowing, doubtless, that those expressions are, in themselves, a disapproval of the lawless and impracticable "policies" of his predecessor.

We confidently look for a gradual re-establishment of normal conditions, and, with such conditions restored, we shall, doubtless, experience a long period of splendid National growth. Even now the life blood is again quickening in the veins and beginning to rush through the arteries of commerce. Great wealth will again be produced because it can be transported to market. Capital, relieved from fear of the effects of executive folly or legislative interference, will again be invested in extending and improving lines of transportation, until vast natural resources yet undeveloped or unknown shall be made accessible and brought into the markets of the Nation and of the world.

We even hope that the day will soon come when the masses of the people will honor the wise Master Builders of the Nation, and execrate the memory of the demagogues.

Chapter III.

GREAT MEN VERSUS DEMAGOGUES.

"Because a half dozen grasshoppers, under a fern, make the field ring with their importunate chink, whilst thousands of great cattle repose beneath the shadow of the British oak, chew the cud and are silent, pray do not imagine that those who make the noise are the only inhabitants of the field; that of course they are many in number, or that, after all, they are other than the little, shriveled, meager, hopping, though loud and troublesome, insects of the hour."—Edmund Burke.

Throughout the history of the human race two classes of men have been prominent.

First. Great men, who, because they are strong and courageous, dominate multitudes of their fellow beings. Such men have courage and ability to do things—to command and guide and produce results. They do not fear to stand for truth and justice. They rule their race by divine right. They make history and their names live on through the ages.

Second. Demagogues, who, for a brief period, manage to obtain the emoluments of office by pandering to the prejudices and passions of the people. Such men deceive multitudes of good people, and stir up the passions of the base and ignorant. They seize upon any issue and advocate any fallacy which they hope may, for the moment, appease the masses and make themselves popular.

America has produced many Statesmen and Commanders who belong to the first class, but her peculiar conditions have forced into commercial pursuits a large proportion of her great men. Such are many of those who have builded and commanded vast industrial and commercial enterprises. Pre-eminent among this class of American leaders are those strong men of action who have developed the magnificent modern system of transportation, now in existence in the United States.

America has also produced many men of the second class, and during the past decade tney have been more obtrusive and pestiferous

than ever before. As the brief-lived toadstool flourishes best amid the fetid vapors of the dung hill, so do such men prosper most during those eras in human affairs when corruption of morals and decay of patriotism are most active. In recent years our Statesmen and Empire Builders have been much hampered in their work by the demagogues among us. Such are some of those men who now, for a brief period, hold the reins of power, in some of the states, and seek to gain control of executive and legislative departments of the National Government. Even the judicial department, wonderfully pure as it has hitherto remained, has, in recent years, been threatened with invasion and corruption by these jackals. Though such fellows frequently succeed in misleading honest and honorable men, their power is shown chiefly in deluding the ignorant, deceiving the unthinking and unfortunate, and stirring up the passions of the base and corrupt. They usually pose as reformers, though themselves dishonest and incapable. In the guise of reformers, such men have often deceived multitudes of good citizens and led them into foolish and ruinous attempts at revolution or social upheaval. Lord Macaulay has truly said: "In every age the vilest specimens of human nature are to be found among demagogues." (Mac. Hist. Eng., Ch. V.)

In the United States the number of men of this type is small in comparison with the number of brave and true men who serve the people of the Nation in innumerable official capacities, but, like the "half dozen grasshoppers" of Burke's simile, they attract much attention by their "importunate chink." During the last presidential administration these "little, shriveled, meager, hopping, though loud and troublesome, insects of the hour," swarmed about our ears under the guise of "muck-rakers" and "reformers." Through the magazines and public prints, from lecture platforms and in the halls of legislation they made much noise, and succeeded in harassing and worrying the great men of the Nation no little. Even the pulpit and the bench were, to some small extent, infested with the "troublesome insects."

During that period their pestiferous activity was manifested in slandering and traducing the great men of the Nation, who had guided her in her astounding physical development and had made it possible for her people to utilize portions of the vast natural resources of a great Continent. For a time they succeeded (as their kind had frequently done in former ages) in stirring up bitter hatreds, even among worthy and upright citizens; they gained temporary ascendency over the minds of multitudes of the volatile, thoughtless and ignorant; they

excited the passions of the base and vile, who, having nothing to lose and all to gain, are ever ready for change and upheaval. These fellows had reasons to believe they had the sympathy and support of the President of the Nation. The better class of citizens also became convinced of that sympathy and support, and the natural result was financial panic, with a temporary partial paralysis of all great industries and an almost total suspension of the development of the Nation's transportation systems.

During the period preceding the panic, the demagogues, who are ever incapable of grasping great ideas or of understanding National conditions, were particularly strenuous in stirring up bitter animosities and mean jealousies by pointing out and magnifying the real or supposed weaknesses and peccadilloes of the owners and managers of great industries, and in this they accomplished their purpose chiefly by falsifying or distorting facts and figures. They were specially bitter in their denunciation of the builders and owners of the Nation's lines of rail transportation. By exaggerating such small faults and inconveniences as are inseparable from the management of all human affairs, they sought to impeach the motives and discredit the ability of the men who were intrusted with the management of those systems. They went among the clerks and employees of the railroads and sought to corrupt them and make them disloyal to their employers. Their small success in this villainous work is eloquent of the wisdom, justice and uprightness of the managers of most of our railroads. They procured the enactment of innumerable foolish laws designed to regulate railroad rates and operations, in accordance with the foolish notions of inexperienced visionaries and theorists.

By appealing to the basest instincts that can guide human conduct, these men succeeded in stirring up among multitudes of people a bitter hatred towards the very agencies that had been most effective in producing the astounding wealth and prosperity of the Nation. By such despicable methods, many of the demagogues succeeded in grasping temporary power for themselves, but at frightful cost to the American people.

Even before these activities finally precipitated the panic, the credit of the transportation systems had been destroyed, not because men who had capital to invest doubted the efficiency or integrity of the managers of the railroads, or the wisdom of their plans, but because no one could foresee to what excess of frenzy executive folly and demagogic activity might urge the mob, in their blind hatred of the railroads.

In one of the Southern states the passions of men were so aroused by the skillful manipulations of an unscrupulous demagogue that threats of violence were freely indulged, when a judge of a National court issued orders restraining the enforcement of anti-railroad laws, which he pronounced to be confiscatory, and manifestly unconstitutional. These laws had been enacted for the avowed purpose of obtaining revenge upon the management of a railroad system that had been the chief agency in increasing the prosperity of the State and in developing a large portion of its natural wealth. This suicidal folly was but little more aggravated than that which was in evidence in several other Southern and Western states.

The most terrifying feature of the whole situation was the fact that men believed that behind all the madness and folly were the power and influence of the President of the Nation. Whether this was correct or otherwise, it is at least certain that the President did nothing to allay the violent passions that had been aroused, and that his every public utterance and action seemed designed to fan the smoldering fire and add fuel to the flames.

The wave of folly and fury that deluged the Nation during the Roosevelt administration paralyzed the activities of the railroads, so far as extensions and improvements were concerned. The railroad managers, many of whom had spent their lives in studying methods for developing the natural resources of the Continent, had formed wise and far-reaching plans for vast extensions and improvements, in which they had determined to expend many hundreds of millions of dollars. Much of this work had been begun before the agitation culminated in the panic of October, 1907. That financial cataclysm made it necessary to suspend all such work; and, since then, practically nothing has been accomplished.

The situation is now most remarkable. The population of the country is growing steadily and rapidly and is spreading out over large areas of inland territory. It is apparent, to all thinking men, that greatly enlarged transportation facilities must soon be indispensably necessary. That extension and improvement of the railroads are the only possible means of meeting the conditions is absolutely certain; and yet the railroads are doing no building, and the country is being flooded with pamphlets, speeches and lectures, and with newspaper and magazine articles and editorials advocating the construction of waterways that are impossible, and canals that would be utterly worthless and useless, if built.

The railroad managers are still hampered and embarrassed by the disastrous effect of the agitation that brought ruin during the Roosevelt administration; by the existence of countless anti-railroad laws; and by the rulings of irresponsible railroad commissions, composed of politicians who are, for the most part, wholly inexperienced in transportation affairs and incapable of understanding the conditions that they have been appointed to "regulate." Many of the great Empire Builders are disheartened by the ingratitude of the people of the Nation for whom they have done so much, and by the absence of any kind of assurance that there may not soon be a recurrence of the frenzy that swept over the Nation during the Roosevelt era.

The suspension of railroad construction, under existing conditions, presents to the demagogues, political agitators and professional grafters a phenomenal opportunity, which they are quick to see. They have found that the National courts stand between them and the spoliation of the railroad systems, for which they have been scheming, but they yet see a chance to turn to advantage the unreasoning prejudice against railroads, that prejudice which they had been so successful in producing.

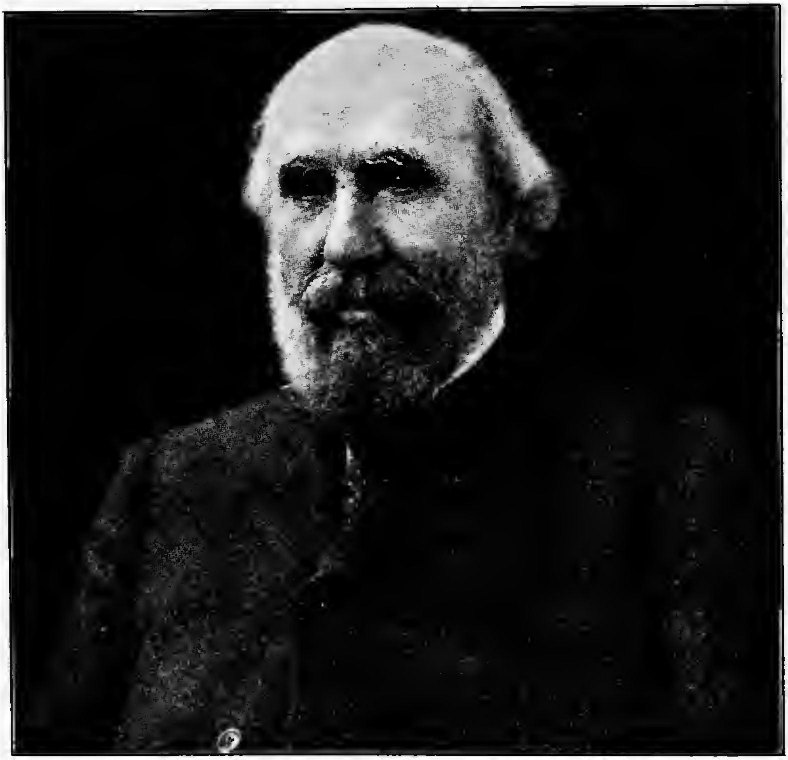
Now, from every quarter, they are urging upon the people, whom they hope again to deceive, the construction of waterways instead of railroads. The certainty of infinite opportunities for graft and loot if they can bring about the issuance of government bonds for waterway construction, whets the appetites and stimulates the energies of men who know nothing and care nothing about transportation problems, either by rail or by water.

That the schemes for waterways are, almost without exception, absurdly impracticable or manifestly impossible, is nothing to the agitators, who are solely interested in the issuance of bonds.

A large portion of the following pages will be devoted to a discussion of the merits of existing waterways and of proposed new schemes. Before passing from the subject discussed in this chapter, it is pleasing to be able to note evidence from many quarters that the citizens of America are waking up to a realization of the folly into which the demagogues had led many of them.

From Mississippi in the far South, from Seattle in the extreme Northwest, and from many other quarters come evidences that the spell of the demagogues is being broken; that reason is again asserting her sway over the people.

James J. Hill, the great Empire Builder of the Northwest, who is chiefly responsible for the prosperity of several great states, but who had committed the crime of building and operating one of the greatest railroad systems in the world, was heartily welcomed and applauded by the multitude who assembled in Seattle to witness the opening of the Exposition in June, 1909. If he had done these things in Canada, or anywhere else in the British Empire, he probably would have been covered with decorations and raised to the peerage. In America he



JAS. J. HILL,
Railroad and Empire Builder, of the Great Northwest.

had been mercilessly attacked, vilified and abused by "the little shriveled, meager, hopping, though loud and troublesome, insects of the hour." Truly, a great change has been wrought since the fourth of last March.

More encouraging yet is the fact that the great Edward H. Harriman, wonderful executive and organizing genius who was, during the Roosevelt era, publicly denounced from the White House as "an undesirable citizen," has, since his recent death, been extolled by editors, statesmen, financiers, jurists and priests, as one of the greatest of Americans. Surely public sentiment has undergone a great revolution and men are regaining their reason.

Our splendid National judiciary has always stood staunch and true, breasting the waves of folly and madness that beat about them and threaten the Constitution that they are sworn to sustain. They deserve honor and gratitude from every American citizen.

Just at this juncture in our affairs, however, the men who should be most honored in America are the few strong, courageous ones among the Generals of Transportation, who did not quail during the recent storm of passion and prejudice; who, with magnificent determination and fortitude, stood firmly and uncompromisingly for Justice and Judgment, whilst cowards surrendered or basely truckled to the demagogues.

E. H. HARRIMAN,

Railroad Organizer, Financier and Executive Genius.

Chapter IV.

INLAND WATERWAYS.

"Such stuff as dreams are made of."—Shakespeare.

Two hundred years ago our English cousins were suffering from the effects of a costly war that had entailed a big National debt. The "South Sea Company," composed of shrewd rascals, captured the imagination of an unwise executive and an always gullible public, with a get-rich-quick scheme, which they advocated as a means for avoiding the results of past folly and extravagance. For a time a wild orgy of mad speculation ran riot. The "South Sea Company" speculation was based on preposterous, impracticable schemes, but none of them were more absurd than most of the inland waterway schemes now advocated by the "Conservation" cranks and bond-issue "Boomers" in the United States. The "South Sea Company" was so phenomenally successful in shearing the English lambs of the Eighteenth Century, that many other rascals and charletans tried to rival it, and succeeded wonderfully well for a time by organizing stock companies and selling immense quantities of worthless paper. No scheme was too ridiculous to find subscribers; the credulity of the people seemed to be inexhaustible and their folly boundless.

Some of the companies hawked about were for the most extravagant projects. We find among the number the following:

"For furnishing Funerals to any part of Great Britain."
"Wrecks to be fished for on the Irish Coast."
"Insurance of Horses and other Cattle" (two million pounds).
"To make Salt Water Fresh."
"For building Hospitals for Bastard Children" (two million pounds).
"For making Oils from Sunflower Seed."
"For extracting Silver from Lead."
"For the transmuting of quicksilver into a fine malleable metal."
"For importing a number of large Jack Asses from Spain."
"For a Wheel for a Perpetual Motion" (one million pounds).
"For a purpose that shall in due time be revealed," etc., etc.

All of those were eagerly subscribed for. The last one, perhaps the most remarkable of all those mentioned, was doubtless the first "Blind Pool."

"Each subscriber was to pay down two guineas and hereafter to receive a share of one hundred, with a disclosure of the object, and so tempting was the offer that one thousand of these subscriptions were paid for the same morning, with which the projector went off in the afternoon." (See Lord Mahon's History of England.)

For a time conservatism and common sense were thrown to the winds, and men of all classes of society seemed bewitched by the attractions of impracticable wind and water "bubbles." After awhile some one demanded actual solid money payment, instead of paper promises, and immediately the "South Sea Bubble" burst and wrecked thousands of fortunes.

During the same year France was trying to escape from a great debt, which had been contracted in ministering to the vanity of Louis the Fourteenth, who had, like our last President, over-ridden precedent; handled the "Big Stick"; proclaimed, "I am the State"; upset constitutional order; discredited lawful authority, and started the forces that led up to the French Revolution. John Law, who seems to have been both rascal and dupe, secured the confidence of "the weak, vacillating and cowardly regent." He financed the "Mississippi Bubble." It was also promoted by rascals and charletans who dealt in wind and water. Again, an unwise executive was deceived and a gullible public was plundered. A wild orgy of speculation, encouraged by false estimates of values and misrepresentations of facts, was followed by a total collapse. The lives and fortunes of thousands were wrecked. The following quotation from a paper written by one of the dupes, while the bubble was being inflated, looks worthy of one of our Twentieth Century waterway boomers. The paper was written during the period in which the "Mississippi Bubble" excitement was at its height in France, and probably quotes current statements, which the author ignorantly attributed to Father Hennepin, a respectable authority:

"The whole extent of that immense country of Louisiana, reaching to the South Sea, Japan and Frozen Ocean. * * * This country of Louisiana and Mississippi is so temperate and healthful that it may be called the French Paradise, and the inhabitants are scarce subject to disease. The soil is so fertile that it yields two crops yearly without plowing or sowing. It has great abundance of sugar cane, tobacco, cot-

ton trees, silk worms, corn, hemp, vines, etc. It has plenty of fishes, fowls and beasts of many kinds not found in Europe. Their wild oxen are much larger than ours, and instead of hair are covered with fine wool, as fine as any sheep in Europe. It is also well stored with mines of iron, copper and silver in St. Barbara, St. Johns and Ende, dug up by the Spaniards, etc., and many gold mines are near the river Missouri. But the chief glory of Louisiana is the vast river Mississippi, the first river in the world. It springs from several lakes to the westward of Hudson Bay, etc., etc. * * * In short, the vast river Mississippi, with its many branches (extending over all the immense country of Louisiana), may safely open a communication between New Spain and Canada and between the South Sea and the Gulf of Mexico." (See De Bow's Commercial Review for 1847.)

Compare this with the estimates and statements relative to the proposed "Ship Canal" and "Deep Waterway" from Chicago to New Orleans, which have been issued from Chicago during the past few years by the advocates of the "Twenty Million Dollar Bond Issue," which the public is assured will build a sixty-mile extension of a ship canal, thirty miles of which, though not yet finished, have already cost sixty million dollars. The "wild oxen covered with fine wool" are tame in comparison with assurances given these "boomers" to the gullible public, of a revenue of $25.00 per horse-power, per annum, for water power to be developed by building dams in the Illinois and Des Plaines Rivers, within a score of miles of one of the greatest coal fields in the world; of a revenue of fifteen to twenty dollars per acre, per annum, from fish crops to be obtained from the flooded territory, and of an income of five dollars per acre, per annum, from timber from flooded lands, on which thousands of trees are now dying.

The "South Sea" referred to in the ancient document above quoted is the Pacific Ocean, and the "Inland Waterway" from the Gulf to the Pacific, therein suggested, was by way of the Mississippi and Missouri Rivers, across the crest of the Rocky Mountains and down the Colorado River, through the Grand Canon and the Gulf of California to the "South Sea."

Is it inconceivable that men in those days could accept such wild dreams as sober fact and invest money in them? Not at all. Fools we have with us always. To cite a few recent examples may be illuminating:

First. Sometime ago I read a "strong" editorial in a Southern newspaper gravely advocating a scheme for diverting the waters of the Tennessee River through Sand Mountain into the Warrior River of

Alabama, in order to "promote navigation" on the latter stream. This would require a cut of about three hundred feet deep and forty miles long, through solid rock, and the navigation of the Warrior River would be economically impracticable if the whole of the Tennessee's waters were flowing through its tortuous channel.

Second. In the spring of 1908, a "Conservation Convention" was assembled at the White House, in Washington, in which statements were made about the exhaustion of the resources of our vast territory, in comparison with which the braying of the "large jack asses from Spain" would seem rational; the remedies then proposed and applauded were so preposterous that one might suppose they had all been originated by our National forester, whose department, sometime ago, sent out to each of the "Rangers" a two-gallon rubber bucket, to be used in extinguishing forest fires. It is said, in Montana, that when a forest fire is started the "Rangers" ordinarily mount their horses and hasten to some high ground whence they can watch the progress of the flames and determine in which direction to flee for their lives.

Third. I have on my desk a lengthy treatise, by Mr. M. O. Leighton, Assistant Hydrogapher to the astounding "Inland Waterways Commission," which advocates a water scheme, the absurdity of which causes the ancient proposition for sending ships across the Rocky Mountains to pale into insignificance. I shall discuss Mr. Leighton's scheme at some length in the next chapter.

In this year of grace, 1909, the people of the United States are just recovering from the effects of a disastrous financial panic. There is much dispute as to what caused that panic, but the concensus of opinion, among the financial leaders, seems to be that there was no natural cause or economic justification for it; that it was precipitated because of the terror produced among all classes of property and security holders by the demagogic and socialistic agitators, who appeared, to many, to be receiving encouragement and support from the highest officer of the Nation. The properties of the transportation companies seemed in danger of confiscation or destruction. One great industrial corporation was hastily fined twenty-nine million dollars for acts, that have since been pronounced, by the higher courts, to have been without evidence of guilt. Whatever may have been the cause, there can be no question at least as to the result—a calamity that shook the whole Nation and blasted the hopes and fortunes of large numbers of innocent people. Again, multitudes have suffered from the effects of somebody's folly, and again, true to precedent, there promptly appears a popular insan-

ity—this time it is the "Inland Waterways Craze." Again, wind and water, as of yore. Misinformed and misguided enthusiasts, as well as conscious quacks, charlatans and political grafters are appearing in increasing numbers with absurd estimates of costs for constructing and operating waterways, and with ludicrous statements of probable profits and benefits, from "navigation," "water power," "flood prevention," "purification," "sanitation," "forestation," "conservation" and one knows not what other rank absurdities. There is much divergence of views among these gentry as to facts, figures and methods, but there is a beautiful sympathy and oneness among them as to the means for quickly converting the United States into a Paradise, or, rather, a Nirvana, and again the proposition is **paper promises**, i. e., government bond issues of stupendous proportions. Our English ancestors lost their wits, in the days of the "South Sea" mania, and eagerly exchanged solid pounds and shillings for glittering prospects and paper promises. The French of the same era went mad, and rushed even more wildly into the "Mississippi Bubble" frenzy and invested hundreds of millions of francs in wind, water and paper promises.

What will America do with the "Inland Waterways Craze"? Already many ordinarily sober-minded persons seem to be demented on the subject, and the promoters and "boomers" are abroad in the land advocating bond issues, i. e., paper promises for thousands of millions of dollars, from the proceeds of which to pay for the construction of worthless, impracticable or impossible canals and waterways. We have now more miles of inland waterway than any other Nation of the earth, and we make practically no use of them, because experience has proven conclusively that under modern American conditions rivers and canals cannot be economically utilized as avenues of traffic, except in rare instances and then only temporarily. In spite of this experience the "boomers" propose to cure all our ills, present and prospective, by entering upon the construction of innumerable other waterways that would cost billions of dollars. Our enthusiasts and charlatans have not yet begun to advocate the capitalization of companies for "A Wheel for a Perpetual Motion," and they make it evident that we do not now need to import "Jackasses" from Spain or elsewhere, but they are all loudly clamoring for bond issues, "For a Purpose that shall, in due time, be Revealed." The "boomers" argue that this Nation possesses stupendous wealth; her credit is unlimited; business is dull. Why should we not hypothecate the future; issue a stupendous volume of "promise to pay"; go in for a saturnalia of riotous expenditure;

have a "good time," and let the devil take care of the consequences? So tempting is the proposal to the vicious and weak-minded that demagogues, agitators and grafters are eagerly advocating the issuance by the National Government of bonds, practically without limit, for purposes which no one understands, for which no definite plans or estimates have been prepared, and for which the sole argument is **"we believe it will divert traffic from the railroads."** They are putting forth innumerable false and foolish statements; they are circulating doctored statistics and garbled quotations from official reports. They are manufacturing absurdly inadequate estimates of cost and even more absurdly visionary and impossible forecasts of the benefits that they allege will result from their wild schemes. They are shamelessly advocating waterway transportation propositions that are more ludicrous than were the schemes put forward by the charlatans who deluded our ancestors in the days of the "South Sea Bubble." Mrs. Jellyby's humanitarian schemes were wise and practical, and rainbow-chasing is a profitable industry in comparison with some of the propositions that are now being boldly advanced by men who clamor for a government bond issue of stupendous proportions in the interest of waterways. Multitudes of honorable and upright men are again being deceived. One might think it impossible that business men of character and ability could so readily fall into the "snare of the fowler" were it not for the fact we have authentic accounts of many popular delusions that have held sway over all classes of men in the past.

Mackay's very interesting book entitled "Memoirs of Popular Delusions" opens with the following sentence:

> "The object of the author in the following pages has been to collect the most remarkable instances of those moral epidemics which have been excited, sometimes by one cause, sometimes by another, and to show how easily the masses have been led astray, and how imitative and gregarious men are even in their infatuations and crimes."

The author proceeds to give an account of the ancient Netherlands lunacy about Tulips, and tells us that, "once upon a time," a wild craze seized upon the sober, unsentimental and unimaginative inhabitants of the "low countries," and honest burghers lost their wits as well as their florins in speculations, having for their basis nothing more valuable than the root bulbs of **Tulips.** The craze went beyond all conceivable bounds, and single Tulips sold in Amsterdam and elsewhere for as much as 4,000 florins. During the period of insanity one poor sailor

mistook a Tulip bulb for an onion, which it closely resembled, and ate it with his pickled herring. He was promptly flogged and thrown into prison. After a while the honest Dutchmen waked up to a realization of the madness of "Tulipomania" and there are no recorded results more serious than some suicides and the wrecking of many fortunes.

We, in America, are just emerging from a period of anti-railroad insanity. Shall we at once plunge into a waterways mania? If the people of the Nation again surrender themselves wholly to the spell of the insensate demagogues and agitators, it will probably be impossible to stem the torrent of folly that threatens to engulf us. It is the task of brave and true men to attempt to prevent this, even though it be at the cost of enduring much vituperation, abuse and persecution.

The courts have checked the fury of the anti-railroad craze, but they cannot intervene to stop or stay the mania that now threatens. If the storm breaks upon us with unabated force, as now seems imminent, National bankruptcy may result.

"The Engineering News" is one of the safest, sanest and most conservative of American publications. It absolutely eschews politics and avoids the sensational. Yet, in a recent calmly expressed editorial on "Public Expenditures for Inland Waterway Improvements," we find the following:

"At the present time a huge campaign for waterway improvement is in progress. Paid lecturers are going about the country circularizing false and most foolish statements regarding the public benefits to result from expenditure on waterways. The newspapers teem with similar statements. There is grave danger that the Nation will be plunged into an abyss of debt for waterway construction. Many interests conspire to forward such measures. One of the largest and most influential banks in New York recently issued a circular in which it urged that the Nation should issue at least a thousand million dollars in bonds, because it was wealthy and prosperous enough to afford to pay the interest.

"From such financial and economic heresies—heresies put forth with the motive of private gain—may the Nation be delivered."

On March 14, 1907, Mr. Roosevelt, then President of the United States, addressed a letter to nine officers of the government, requesting them to serve as members of an "Inland Waterways Commission."

Men learned in the law tell us that there is no authority vested in the executive, under which he could appoint such a commission.

The wise founders of our government, foreseeing the danger that personal ambition might sooner or later lead presidents to attempt to enlarge the executive powers, endeavored, in preparing the National Constitution, to reserve to the people all authority not expressly delegated to their official servants. Their wisdom and foresight in this particular have recently been strikingly demonstrated.

Mr. Roosevelt selected, as members of this commission, to consider difficult and complicated engineering and transportation problems one farmer, one forester, one anthropologist, one hydrogapher, four lawyers and one practical engineer. In his letter of instructions to this astounding aggregation, he said:

"It was computed by Generals Humphrey and Abbott, half a century ago, that the Mississippi alone sweeps into its lower reaches and the Gulf 400,000,000 tons of floating sediment each year (about twice the amount of material to be excavated in opening the Panama Canal), besides an enormous but unmeasured amount of earth salts and soil matter carried in solution. This vast load not only causes its channel to clog and flood the low lands of the lower river, but renders the flow capricious and difficult to control. Furthermore, the greater part of the sediment and soil matter is composed of the most fertile materials of the fields and pastures drained by the smaller and larger tributaries. Any plan for utilizing our inland waterways should consider floods and their control by forests and other means, the protection of bottom lands from overflow, and our uplands from soil wash; the physics of sediment-charged waters and the physical or other ways of purifying them; the construction of locks and dams not only to facilitate navigation, but to control the character and movement of the waters; and should look to the full use and control of our running waters, and the complete artificialization of our vast waterways for the benefit of our people as a whole. * * * The report of the commission should include both a general statement of the problem and recommendations as to the manner and means of attacking it." (See Senate Document No. 325, Sixtieth Congress, first session.)

The members of the "commission," all office holders, having definite duties to perform, and bound in honor to attend to them, spent a few months roaming about the country and then submitted a "preliminary report," in which they abused the existing great transportation lines, made vague and general statements and enunciated platitudes. They definitely recommended: "That the President of the United States be authorized, with the advice and consent of the Senate, to appoint a National Waterways Commission, etc., etc.," hut they modestly refrained from suggesting the personnel of such commission. They mentioned a great many suggested schemes for inland waterways. Strange

to say, they seem to have overlooked the connecting link, across the Rocky Mountains, between Missouri River and Colorado River, whereby ships might proceed from the Gulf of Mexico, via the Grand Canon and the Gulf of California, to the "South Sea." They did not mention that magnificent scheme, long ago proposed by one of the dupes of the "Mississippi Bubble," but they did mention many other similar absurdities.

The President forwarded this precious document to the Senate with assurances that "It is thorough, conservative, sane and just"; that "Navigation of the lower reaches of a stream cannot be fully developed without the control of floods and low waters by storage and drainage"; that "The Mississippi should be made a loop of the sea and work upon it should be begun at the earliest possible moment"; that "Deep channels along the Atlantic and Gulf Coasts, and from the Gulf to the Great Lakes, will have high value for the National defense"; that "It is neither necessary nor desirable to postpone the beginning of the work until all the facts are obtained;" that "Adequate funds should be provided, by bond issue if necessary, and work should be delayed no longer."

Solomon has said, "There is nothing new under the sun." Look back through history two hundred years to the era of the "South Sea Bubble," and we find a precedent for Mr. Roosevelt's proposition "To provide adequate funds, by bond issue," for an undertaking about which he says, "It is neither necessary nor desirable to postpone the beginning of work until all the facts are obtained." The precedent is found in the capitalization of a company, "For a Purpose That Shall in Due Time be Revealed."

Chapter V.

RESERVOIRS.

"Navigation of the lower reaches of a stream cannot be fully developed without the control of floods and low water by storage and drainage."—Theodore Roosevelt.

Mr. Roosevelt, in his letter of instructions to the astounding aggregation of men whom he selected to serve on the "Inland Waterways Commission," gravely advised them that they should "Prepare and report a comprehensive plan for the improvement and control of the river systems of the United States." This were an Herculean task, but mere child's play in comparison with the additional requirement that "Such a plan should consider and include all the uses to which streams may be put, and should bring together and co-ordinate the points of view of all users of water." **To bring together the points of view of all users of water.** Magnificent conception! Stupendous labor!! Titanic undertaking!!!

Napoleon, Caesar, Hannibal, Alexander, Hercules, Jove himself, never dared essay such a task.

Think of some of the things involved in it. There are stupendous difficulties that we cannot discuss here, but consider, for a moment, these three: **"To bring together the points of view"** of such "users of water" as, first, the Catholic priest and the Baptist preacher; second, the "Nazarites" of Maine, who, in public places, drink water only, and the "Colonels" of Kentucky, who drink water, not at all; third, the artificially perfumed dandies of Fifth avenue and the naturally perfumed hobos of First avenue! ! It is enough. The brain reels in attempting to grasp the idea, and is likely to take a leap into the "Limbo of the Infinite" and turn topsy-turvy.

Evidently, that is what happened to eight of the men to whom Mr. Roosevelt's letter was addressed. The report that they subsequently submitted clearly indicates such a catastrophe.

Probably there is, in the whole range of the history of human folly and madness, only one incident comparable with the executive action that we are now considering: Herodotus tells us that when Xerxes,

the Persian, marching against Greece, at the head of about five million of soldiers and attendants, reached the Hellespont, he became enraged because the sea did not obey him, and commanded that chains be thrown into it; that it be given three hundred lashes with a whip, whilst he said to it, "Thou troublesome and unhappy element, thus does thy master chastise thee for having offended him." He also wrote the following letter to Mount Athos: "Athos, thou proud and aspiring mountain, that liftest thy head into the heavens, I advise thee not to be so audacious as to put rocks and stones that cannot be cut, in the way of my workmen. If thou givest them that opposition, I shall cut thee entirely down, and throw thee headlong into the sea."

Throwing Mount Athos into the sea were a small and useful labor as compared with doing the things for which Mr. Roosevelt directed his commissioners to "Prepare and report a Comprehensive Plan."

It is interesting to speculate upon the sensations of those unhappy men—the farmer, the forester, the anthropologist, the hydrographer, the four lawyers, and the one practical engineer—when they received instructions, not only to do the things above mentioned, but also to investigate and report on "the manner and means of attacking" the problem of suspending the operation of many of the laws of nature.

They must report on a method for stopping water from running down hill. For preventing the hills from getting dry after the water has run down their sides. For preventing the water from taking any particles of earth from the hill during its descent. For stopping the sun from evaporating the water. For preventing the sediment-bearing water from overflowing the low lands and enriching them with fertile material taken from mountain sides that are too steep to be cultivated. For providing horse-power among the mountains where there is no demand for horse-power. For supplying water for navigation where there are no boats, and where rational people would not use either the water or the boats, if they had them, because they already have infinitely better and more economical transportation facilities on land. These are a few of the problems of which a solution was suddenly demanded from nine weak mortals, eight of whom were accustomed to concentrating their attention on the solution of the one great problem, "How shall I manage to hold on to my office and continue to feed at the public crib?" Doubtless they quailed at first, but it was immediately apparent that the one great problem that they had hitherto solved successfully, was also involved. They quickly rose to the emergency and presented a scheme, long ago proposed by visionaries,

and laughed at and discredited by practical men, i. e., RESERVOIRS.

Mr. M. O. Leighton is, it appears, Consulting Hydrogapher to the Inland Waterways Commission. Looking up his record in an effort to discover some clue that might lead to an explanation of his water hallucination, I find nothing that seems suggestive, unless, indeed, it be the fact that he is a Baptist. Is it possible that a mighty zeal for that faith could prompt a man to propose to bankrupt the Nation in an effort to impound the waters, though it be at the cost of destroying much of the most valuable, populous and fertile portions of our great valleys? No one but Mr. Leighton can answer, and he probably will not.

Incorporated in the Preliminary Report of the Inland Waterways Commission, as an appendix, is found a paper prepared by Mr. Leighton, which solves many of the difficulties for which the President demanded a solution, at least so far as the Ohio River Valley is concerned. He did not essay the Jovian labor of "bringing together the points of view of all users of water," but he did venture upon that of solving all the other difficulties. He makes it all plain and simple and easy. Briefly stated, the solution is, in effect, as follows: (See page 451, Senate Doc. No. 325, Sixtieth Congress, first session.) About one thousand square miles of land, along the Ohio, worth fifty dollars an acre, are sometimes flooded, for a fortnight, during the winter season. To stop this we will build great dams that will permanently flood 2,000 square miles of the fertile and populous valleys of Pennsylvania, Kentucky, Tennessee and the Virginias, where land is worth $200.00 per acre, for farming purposes, and $1,200.00 to $1,500.00 per acre for coal, oil and gas.

The waters now bring down rich sediment from the mountains and spread it out over the valleys. We will stop that by building great dams across the valleys, which will check the flow of the water long enough to cause it to deposit its load of sediment. We will not only bury hundreds of millions of tons of precious sediment already spread out over the valleys, but we will also provide a receptacle in which can be buried many additional hundreds of millions of tons. The great Mississippi River robs us every year of 400,000,000 tons of soil. We cannot prevent that, but we can show the "Father of Waters" that he is a mere novice at destruction. We can bury, at once, and make worthless some 80,000,000,000 tons of sediment already accumulated in the rich valleys, above our dam sites, and we can ultimately catch and

hold in our reservoirs over 100,000,000,000 tons in addition. This is as much as the Mississippi River can purloin in 500 years.

To stop the sun from evaporatng the water that falls on the hills and valleys, it is only necessary to depopulate the country so that it may be restored to its primeval condition of jungle, swamp and pathless forest, through the leaves of which the sun's rays cannot penetrate.

One of our members—the Noble Forester—is even now successfully turning back the tide of civilization from millions of acres of lonely forest and jungle, in the Northwestern States. He is producing ideal conditions there. The impious children of men are not permitted to settle there; only the mountain lion, the coyote and the forest ranger are allowed to pursue game there. "The cormorant and the bittern possess it; the owl also, and the raven dwell in it. * * * The thorn shall come up and nettle and brambles shall flourish in the open spaces thereof; and it shall be an habitation of dragons and a court for owls." The children of men are not permitted to fell the timber for their uses, but millions of trunks of trees, felled by the forces of nature, lie and rot on the ground, and thus is much timber conserved for many years and much water is conserved in the rotting tree trunks. What the forester is accomplishing in the Western portion of the Continent, we will advocate for the Southern, Eastern and Central portions thereof. Then shall be Universal "Conservation," and the resources of our country shall not be exhausted.

Thus would we also solve forever the problems of navigation and water power—by eliminating them. With the valleys converted into frog ponds and the uplands re-converted into jungles, there would be no occasion for navigation and no use for waterways.

It is difficult to take seriously a plan so preposterous as that proposed by Mr. Leighton, and approved by Mr. Roosevelt and his Inland Waterways Commission, especially when we find it put forward by the same man, who, in November, 1909, gravely announced to the members of the Ohio Valley Improvement Association, in conference assembled, at Wheeling, West Virginia (see pages 124 and 125 of report of that affair): "You will have a coal famine in seventy years, calculating it at the present rate of consumption, to say nothing of a probable increased rate in the near future."

If the "gentle reader" will pardon a brief digression, which may be interesting, in view of the statements, now being circulated, about the exhaustion of our "Natural Resources," we will here call attention to the fact that the report of the Department of Commerce and Labor,

for the year 1908, issued eighteen months later than the date of this terrifying prophecy of Mr. Leighton's, informs us that the total "**known**" supply of coal in the United States is 3,135,708,000,000 tons (not including inexhaustible deposits in Alaska and, of course, not including the stupendous deposits recently discovered in British Columbia, on our Northwestern border, which must find a market in the states), whilst the highest production in any one year—1907—was 429,000,000 tons. Now the amount **known** to exist divided by the highest known rate of consumption gives the neat little period of 7,309 years, and we strongly suspect that there are many decillions of tons of coal hidden away in the bowels of the earth, about which Mr. Leighton and Mr. Roosevelt have not yet been advised, and besides, we find that the rate of coal consumption has been **greatly reduced** since 1907.

But let us return to a consideration of the Leighton-Roosevelt "water-cure" scheme. Mr. Leighton's fuel-exhaustion prophecies rather shake our confidence in his "point of view" as well as in his "perspective of observation." He tells us that the reason why the army engineers refuse to worship at the shrine of the "Roosevelt Policies" is because of their defective "point of view" and narrow "perspective." What shall we think of a "perspective" that so readily narrows 7,000 years into seventy?

Inasmuch as Mr. Roosevelt, when President of the United States, gave the reservoir scheme his unqualified approval and even went the length of sending to Congress a message rebuking and condemning the Engineers of the Army Establishment, because they disagreed with Mr. Leighton (see President's Annual Message to the Congress, December, 1908), we will attempt to consider it as seriously as possible.

An abridged copy of Mr. Leighton's paper appeared in the "Engineering News" for May 7, 1908, and it now appears, in full, in the "Preliminary Report" of the "Inland Waterways Commission," which has at last been issued from the government press—fourteen months after its formal transmission to the Senate, on February 26, 1908.

The scheme was made much of by the daily papers published in Washington during the "Conservation Convention" of May 14, 1908. By a **fortunate coincidence** it appeared in "Engineering News" on May 7, 1908, just a week before the assembling of the "Governor's Conservation Convention" and, of course, too late for consideration or reply, by other engineers, before it should have an effect upon the minds of the "Innocents" who had been called there, from all quarters of the land.

Many other and similar "co-instances" have occurred during the nursing period of the "Waterways Craze." Just why the publication of the full report of the "Inland Waterways Commission" was delayed until May, 1909 (fourteen months after its transmission to Congress), is not clear. Perhaps its authors, having gained some modicum of wisdom from further experiences, would gladly have permanently withheld it from the public.

Persons interested in curios might find it worth while to read Mr. Leighton's paper, even at this late date. He states that he borrowed the Reservoir idea from a British engineer, who made the suggestion in the year 1800. We do not know who the "Britisher" was, nor from what public institution he had escaped, but we recall that, long ago, Shakespeare made the grave digger in Hamlet state to that afflicted prince that such things do not attract attention in England, because everybody there is in the same unfortunate condition.

Mr. Leighton proposes, apparently in sober earnest, to prevent floods in the Ohio and Mississippi Valleys by catching and holding in immense reservoirs a portion of the water that falls in the mountains. The dams to form these reservoirs are to be from 38 to 251 feet high. They are to be built with sluices near the bottom. When the low water season comes, these sluices are to be opened so as to supply water for navigation—the rate of supply being regulated in accordance with the needs of navigation. The flow from the reservoirs is to provide water power for factories. The water power revenue is to pay for the reservoirs. The diminished flow of rivers will reduce soil wash. The reduction of soil wash will purify the waters for drinking purposes. The purification of the water will prevent disease. The prevention of disease will enable men to work in the factories, that are to be run by the water power, that is to be supplied by the reservoirs, that are to furnish water to float ships, that are to carry the manufactured articles and the raw material, from and to the factories, that are to be—just like "The House That Jack Built."

So magnificent is this scheme, that, as a wealth producer, it causes the "South Sea Bubble" to pale into insignificance before the new luminary. John Law never dreamed of such possibilities when he was financing the "Mississippi Bubble." The English geniuses who financed schemes "to make salt water fresh" were bunglers, and the scoundrels who sold stock in a "Wheel for a Perpetual Motion" only caught a glimpse of the shadow of the coming events of the Twentieth Century. The scheme is beautiful in theory, but, unfortunately, like

the Louisiana wild oxen "covered with fine wool," it won't work—indeed, balks at the first effort to put the harness on. That it is wholly impossible, we will proceed to demonstrate:

First. Navigation. The total flow from the Ohio River watershed was stated by Generals Humphrey and Abbott to be 5,000 billion cubic feet per annum. The United States Weather Bureau has stated it to be 6,200 billion cubic feet. Captain Wm. D. Connor, of the Corps of Engineers, U. S. A., who pointed out some of the absurdities of the Reservoir scheme (see "Engineering News" for June 11, 1908), assumed an average between these figures of 5,600 billion cubic feet per annum. A discharge of about 190,000 cubic feet per second is necessary in order to give a nine-foot stage (the depth now sought) in the channel at Paducah, which is below the mouth of all the large tributaries of the Ohio. To maintain a flow of 190,000 cubic feet per second would require 6,000 billion cubic feet per annum, or 400 billions more than the total run-off of the entire basin, for an average year. Mr. Leighton admits that his scheme could only "conserve" one-third of the total yearly run-off, whilst the whole of it would utterly fail to produce the navigable stage now sought.

The width of the river and its slopes are as great at some points far above the mouth of the Cumberland and Tennessee Rivers as at Paducah, which is below the mouth of those streams. At such points the maintenance of a nine-foot stage would require as much water as at Paducah, but Mr. Leighton has located 46 per cent of the area, from which he proposes to "conserve" the water, in the Cumberland and Tennessee River basins. Manifestly, that water could not maintain navigation in tne Ohio above the points at which those streams empty into it. He would then, at such points, have to face the same demand for water as at Paducah, with only 54 per cent of the supply. What has been shown to be impossible of accomplishment at Paducah, with a given supply of water, need not be discussed where there would be only 54 per cent thereof available. So the navigation feature of his scheme falls to the ground and he is forced to confess that it would be necessary to have locks and dams, in order to give a nine-foot stage in the Ohio River all the year.

Again, Mr. Leighton plans to maintain a navigable stage of water in the Cumberland, Tennessee, Kanawha and other tributaries of the Ohio at the same time and from the same reservoirs that are to supply the Ohio River proper. It frequently happens that there is a good nine-foot stage of water in portions of the Ohio at the same time that the

water is very low in the Tennessee, Cumberland, Kanawha or other tributaries (and vice versa). Under such conditions the reservoirs in the valleys of those tributaries would be exhausted in maintaining local navigation without making any valuable contribution to the Ohio navigation, for which there would be already an abundant supply. Subsequently, when the water would be needed for the Ohio, the reservoirs of the tributary streams would have none to contribute and again the whole scheme would break down, even supposing that all of the reservoirs had been filled, which, as a matter of fact, would happen only once in four or five years.

The Chief of Engineers, U. S. A., has made an estimate for locks and dams and finds that the total cost, for the Ohio River alone, for a nine-foot stage, will aggregate $73,012,864.00 (see House Document No. 492, Sixtieth Congress, first session). The locks and dams would be effective without the reservoirs and, therefore, the reservoirs would contribute nothing of value to navigation. So much for one phase of the scheme.

Second. Flood Prevention. Captain Connor has pointed out the fact that Mr. Leighton's proposed reservoirs could not prevent floods in the Mississippi River below Cairo, since, if his most extravagant claims for them were practicable, they would take off only the top of the flood and keep the water within the river banks. As a matter of fact, they could not possibly do even that. A bank-full stage in the Ohio in combination with floods from the Missouri and Upper Mississippi Rivers, has caused some of the worst floods known in the Lower Mississippi. It would, therefore, still be necessary to maintain the Mississippi levees, which have been built and are effective for protection from floods. The Reservoir scheme, even if practicable for the Ohio River, would utterly fail to prevent floods in the Lower Mississippi Valley.

The total area of the Mississippi basin is 1,240,000 square miles. The area of the portion of the Mississippi basin comprising the Ohio basin is 201,700 square miles. The total aggregate area of the portion of the Ohio basin, above the dams proposed by Mr. Leighton, and from which he would conserve only a part of the run-off, is about 41,550 square miles. This is about one-fifth (1-5) of the area of the Ohio basin and about one-thirtieth (1-30) of the area of the whole Mississippi basin. The insignificance of this little area is shown graphically on Map No. 1, hereto attached. This map includes the whole Mississippi basin, and the Ohio basin. Within the latter, little rectangles are shown, which are drawn to scale, to include areas equivalent to

the proposed conserved areas as described in Mr. Leighton's paper. Map No. 2, hereto attached, shows the same data as Map No. 1, but it also shows the area over which was precipitated the heaviest portion of the rainfall, which caused four of the greatest recorded floods in the Mississippi Valley, i. e., those of 1882, 1883, 1884 and 1897. An inspection of Map No. 2 reveals the fact that the heaviest rainfall, which caused the first three of those floods, was on territory remote from Mr. Leighton's proposed reservoirs, and that in those years the reservoirs would have had no appreciable effect in reducing the floods of either the Ohio or Mississippi Rivers, because they would not have caught the water that fell. To make his idea effective, it would, therefore, be necessary to distribute similar dams and reservoirs over the whole of the Mississippi and Ohio Valleys, else they could not be relied on to catch waters that would fall on portions of the valley where no provision had been made for conservation.

Since the scheme for which Mr. Leighton estimates a cost of $125,000,000 includes only the conservation of water from about one-fifth of the area of the Ohio basin, and since his proposed reservoirs are nearly all within a narrow territory, stretched along the Western slopes of the Appalachian Mountains, it is manifest that they would probably catch the heaviest rainfall only about one year out of five. It is rather more probable that only about one-fifth of his reservoirs would ever be in position to become effective in any one period of flood-producing rainfall. Mr. Leighton admits all of this, though he seems not to realize that he has done so. He says, in his curious paper: "Records show that floods **never** (black face type mine) arise over the entire Ohio River basin at one time. So far, only one-quarter to one-third of the total area has been involved in any flood." Just so, and neither Mr. Leighton nor any one else can foretell what third or what fourth of the great basin will receive the precipitation in any one storm period. Since the scheme for which he presents "estimates" provides only for conserving the rainfall from one-fifth of the area of the Ohio basin, it would be necessary, in order to make the scheme effective, to provide reservoirs over five times as great an area as he proposes, and scatter them broadcast over the whole valley. This is impossible, since there are few if any sites for dams, in the Ohio basin except between the mountain ridges along the Appalachian slopes, where our author has located nearly all his one hundred reservoirs.

Mr. Leighton's scheme would, therefore, wholly fail to prevent floods in the Ohio Valley or to remove the necessity for levees in the lower Mississippi Valley.

Since his scheme would utterly break down, as a means either for preventing floods or providing navigable water, we might dismiss it from further consideration, but the thing is so amazingly preposterous that it is interesting to consider other features.

Third. Water Power. Mr. Leighton avoids committing himself to any definite estimates of the power that his reservoirs would add to present potentialities of the streams to be affected. He hints, darkly, at stupendous figures. For instance, he says as to Tennessee River:

> "The prospects for power development, especially in the highland portions of the river, are enormous. The minimum indicated power developed by the low-water flow of the river and its tributaries is over 1,000,000 horse-power. The profitable development would be far greater than this, while if the system of storage reservoirs, available for construction, were erected, the power would be increased from ten to twelve times."

Let us consider this statement. It is typical of great numbers of wild estimates, now floating through the public prints, and repeated everywhere by the "boomers" and their dupes.

It is manifest that the proposed dams and reservoirs could have no beneficial effect upon the waters of the portions of the tributary streams extending above the lakes or ponds formed by the dams, or upon tributaries in valleys in which there would be no reservoirs. Indeed, it is almost certain that, in most cases, the great lakes formed by the high dams would so completely isolate the portions of the valleys extending along the streams above the reservoirs that those regions would be permanently cut off from all such development as could call for a large local use of power plants. We have, therefore, at the start, an important negative element entering as a factor in the estimates of the value of water power to be produced by the Reservoir scheme. Second, Mr. Leighton does not propose that any power shall be produced, directly, by the head of water behind his dams. Evidently there could be no such power, since the head must be constantly and rapidly fluctuating—the reservoirs being rarely filled, even in the wettest seasons, and being frequently empty, for weeks or even months, in the latter portion of long-continued periods of drought and low water. Mr. Leighton evidently merely means to claim that

the reservoirs would have a beneficial effect in regulating the flow of the streams below the dam sluices, so that persons wishing to develop water power along the lower reaches of the river might be flattered with hopes of a more regular rate of flow, i. e., more water during droughts and less during floods. Instead, therefore, of the head of water in the reservoirs producing any power, the conditions would render it forever impossible for the portions of the streams above the dams, that would be affected thereby, to produce any power at all. Here we have a very large negative factor in the water power computations. In the case of the proposed Tennessee River reservoirs, we find, according to Mr. Leighton's figures, a total "capacity of reservoirs" of 715,320 million cubic feet, and he tells us that this would include "the entire year's run-off" from the areas above the dams. The height of each of the proposed dams and the capacity of the respective reservoirs show an "indicated theoretical horse-power" of about 350,000 per annum, and assuming 80 per cent efficiency we have 280,000 horse-power per annum, as a potentiality, now existing, that would actually be destroyed by the proposed reservoirs in the Tennessee basin.

Third. When we come to consider the possible effects, below the reservoirs, we find that it would, under the most favorable conditions possible, be simply the impounding of 715,320 million cubic feet of water, which must, under the primary conditions that must govern the whole undertaking, i. e.—improvement of navigation—be held in reserve until needed (usually in the late summer and fall drought periods), to help raise the stage of the Ohio River, below the mouth of the Tennessee, at Paducah. If it should chance, during any summer season, that the Allegheny, Monongahela and Kanawha, or other tributaries, should receive unusually heavy rainfall, whilst the Tennessee basin received but little, the latter stream would be almost dried up by the reservoirs, which Mr. Leighton tells us would have capacity for containing all of a whole year's run-off from the territory above the dams; because the conserved water would not be needed to help the navigation on the Ohio and Mississippi Rivers, but must be carefully retained until the drought season, when the supply from the other tributaries should begin to fail. Then only, would the Tennessee reservoirs come into service. In the meantime, what would become of the power plants below the dams in the Tennessee River basin? During the period of waiting the reservoirs would have afforded no help—indeed, would have cut off nearly the entire supply that now

comes from many of the upper tributaries, and thereby put all the water power plants out of business.

Fourth. If, however, we assume the most favorable possible conditions—such as would probably never actually occur, i. e., (A) the reservoirs all full at the beginning of the period when water for navigation would be required; (B) conditions in the Ohio such that the water from the Tennessee reservoir might be released in such manner as to give a constant flow just sufficient to produce a six-foot stage at Knoxville, at Chattanooga, and in the section of the river below Riverton, and, (C) that this would consume exactly the available supply from the Tennessee reservoirs, during the period of low water: with such a combination of almost impossible favorable conditions, how much of the potential energy of the water should be credited to the reservoirs? We will try to determine:

The two largest reservoirs proposed are in the valleys of the Holston and French Broad Rivers, a few miles above Knoxville. The two next in size, but much smaller, are in the Little Tennessee and Hiwassee Rivers, near their mouths and a considerable distance below Knoxville. These four reservoirs give an aggregate capacity of 518,600 million cubic feet, or about 70 per cent of the total for the whole basin. As a rough approximation, we will, therefore, take the fall of the Tennessee River, in the 652 miles of its length, below Knoxville, as giving a fair "average" figure for the "head" of the water conserved by all the proposed Tennessee basin reservoirs, and which might apparently be utilized, below the dams. We have, on this liberal assumption, 715,320 million cubic feet of water falling 520 feet per annum. That would give an "indicated" theoretical horse-power of about 1,300,000, or at 80 per cent efficiency, about 1,040,000 horse-power. This is figured on the assumption that the whole of the fall between Knoxville and the mouth of the river could be utilized, whereas, it is doubtful whether, in practice, as much as 60 per cent, or about 624,000 horse-power, could be made available.

It is evident that Mr. Leighton's estimate of "ten to twelve millions increase of horse-power" to be produced in the Tennessee River Valley "if the system of storage reservoirs available for construction were erected," is as wide of the mark as were his coal exhaustion prophecies, to which reference has already been made. Yet such stuff as he has perpetrated, in this paper, has been heralded abroad throughout the country, and is being repeated and even exaggerated by every waterways "boomer" in the land. It is most astounding that a President of

the Nation should have given such nonsense his unqualified approval.

The water power estimates given in the remarkable paper that we are considering, would probably lead the casual reader to believe that 100 reservoirs, the cost of which the author "estimates" at $125,000,000, would produce about 25,000,000 horse-power. The author estimates that this would be worth $20.00 per horse-power, per annum. This would give a total annual revenue of $500,000,000.00. When the public realizes that this represents the alleged possibilities of only one-fifth of the Ohio Valley, one-thirtieth of the Mississippi Valley, and one-seventieth of our whole home territory, and that, figured in the same proportion (as would probably be done by the average reader) we have in the United States undeveloped water power capable of producing a revenue of about $35,000,000,000 per annum, which capitalized at 3 per cent (Mr. Leighton's figure) gives a value of $1,166,666,666,666.66, it becomes immediately apparent, to the gullible portion of the public, that we need only develop the whole of our water power, at a comparatively trivial cost, in order to become so rich that we may all safely yield to our natural inclination to quit work, and devote ourselves unreservedly to base ball and politics.

No wonder, then, that "Conservation" is extremely popular.

Unfortunately, however, this cannot be quickly realized. There are some difficulties which must first be overcome. For instance: The government has many dams already built in the rivers, that give immense potential energy and an unappreciative and unpatriotic public coldly passes them by, and buys coal at from one to ten dollars per ton with which to produce power. At the government dams in the Muskingum River, in populous Ohio, energy is now sold at fifty cents per horse-power, per annum, and at the city of Augusta, Georgia, it is sold for $1.00 per annum.

We now have ten dams in the Muskingum River. They cost the State of Ohio about $1,500,000. Since that State succeeded in turning them over to the National Government, twenty-three years ago, the average cost of operation and maintenance has been $79,272.00 per annum. In 1907-8 it was $82,696.68. During that year there were twenty-one leases of water power in effect, from the whole system of dams, **and the resulting gross revenue was just $4,625.81** (see pages 1827-39 of Report of Chief of Engineers for 1908). Theory and Practice, though often at odds, rarely get us so far apart as we find them in this water power business.

We have no detailed information as to the leases of water power at Augusta, except the statement that the rate was $1.00 per annum. That is not important now, however, because the dam at Augusta failed last summer, causing immense damage to property in the valley below.

In both of the cases, above cited, the dams are in rivers in which there is always some water flowing. Ever and anon, however, the floods come and smooth out the fall over the dams to such an extent that their continued existence becomes a matter of "faith and not of sight." Having the power that "makes the wheels go round" thus obliterated from time to time, is manifestly inconvenient, and some manufacturers who have been so guileless as to try to make use of it, at government dams in our rivers, now use strong language in speaking of their experience, and in telling why they hastily decided to use other kinds of power.

With power going begging in populous Ohio, supplied by a river in which there is always a considerable amount of water, at what price shall we estimate its value among the mountain fastnesses, where there are no manufacturing towns? Where coal is worth only $1.00 a ton? Where the power is to be supplied from reservoirs that would probably be filled only once in three or four years? Where the conditions presuppose that the water is to be held in reserve until needed to promote navigation, and then allowed to escape fast enough to raise the Ohio to a nine-foot stage at points where it is three-quarters of a mile wide?

We fear greatly that the value of that water power could be expressed only algebraically with a minus sign before a symbol of an unknown quantity. To put it differently: No man, not even an Englishman, would build a factory to be operated by such power, even though he were assured of a pension and a hero's medal. Sadly we lay in the grave the "Water Power Proposition" alongside the "Flood Prevention" and "Navigation" features of Mr. Leighton's brave scheme.

Fourth. Mud. Our recent fiery and impetuous Chief Executive seemed tremendously exercised about our National supply of this valuable commodity. He made railing accusations against the great Father of Waters, accusing him of robbing us annually of 400,000,000 tons of it. If this goes on, how are our demagogues to be assured that they can always find enough mud to fling at the men who have developed the resources of the National domain? The problem is serious and Mr. Roosevelt having given the cue, great numbers of orators, the mem-

bers of his Inland Waterways Commission, magazine writers, scientists and muck-rakers, have been dilating upon the congenial theme.

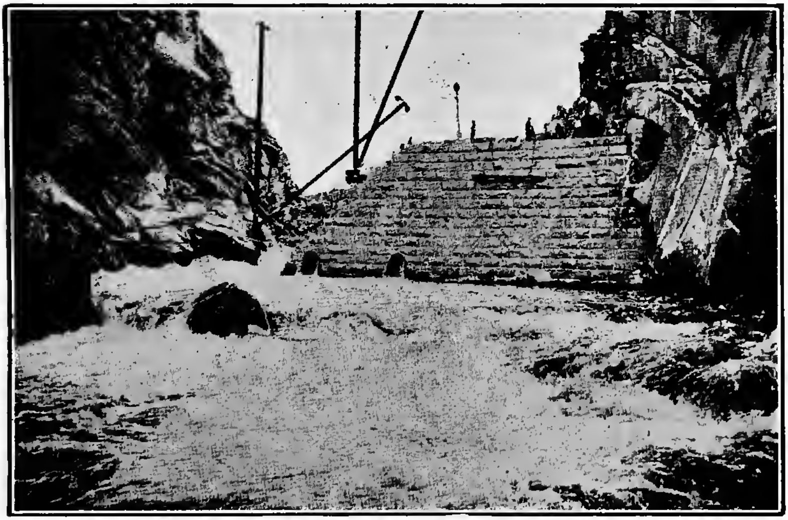
It seems, however, that this anxiety proceeds from an excess of zeal on the part of Mr. Roosevelt and his satellites. The danger that our supply of mud will ever be exhausted is exceedingly remote. Some aeons of ages before our agitators were born, the Gulf extended inland above Port Eads, above New Orleans, above Memphis, above Cairo, up to Cape Girardeau, in the State of Missouri—twelve hundred miles above the present mouth of the Mississippi. In those early days there were no political agitators to interfere with the great Father of Waters and he began levying on the softer materials of the hill slopes and mountain sides of tributary territory. He has kept at it industriously ever since, and has built up a stretch of fertile plain from forty to two hundred miles wide, about seven hundred miles long and of vast but unknown depth. In spite of this strenuous and long-continued activity there is still left among our hills and valleys such an ample supply of soil that we are able to produce from fifty to one hundred bushels of corn, per acre, on a very large part of the despoiled territory, and it is found that its fertility steadily increases when the lands are properly taken care of.

Really, our statesmen should endeavor to be calm and keep their nerves steady when contemplating the diminution of our natural resources. It seems at least certain that it will be millions of years before our supply of mud will give out, and, in the meantime, many generations of demagogues, fools and "conservation cranks" will have been added to the soil.

But this is something of a diversion. Coming back to a discussion of our reservoir scheme: We have found that they cannot be utilized for water power, nor for flood prevention, nor for aids to navigation. How about conserving mud? Here, light breaks through the clouds.

All the experience of mankind as to building dams across water courses has been similar. If you check the velocity of muddy water flowing through a valley, it will quickly deposit a large part of its load of mud. This fact has not hitherto been a source of much comfort to the builders of dams, but then dams, such as Mr. Leighton proposes, have never before been built on the face of the earth. The only dam, yet attempted by man, that is at all comparable, in magnitude, with many of those proposed by Mr. Leighton, is the one that has been built by the English at Assouan, in Egypt, and is now being enlarged. The great Assouan dam has raised the water level of the Nile only sixty-seven

feet, while some of Mr. Leighton's dams are to be more than 250 feet high. Though it was built at the Assouan Cataracts, where solid rock appears to extend across the bed of the river, yet it was found necessary to go down sixty feet, in many places, in order to secure a stable foundation. It is being paid for in sixty semi-annual installments of $382,845 each. This will make the total cost of the dam, including interest, $22,970,000. The value of the territory flooded is not included in this estimate. The Assouan dam, however, was not built to conserve mud. Indeed, every precaution was taken to prevent its catching any mud. The Egyptians also set a high value on mud, but they like it spread out over the land, which, according to nature's beneficent plan, it greatly enriches.



NEAR VIEW OF THE PATHFINDER DAM, SHOWING THE MASSIVE CHARACTER OF ITS MASONRY.

Pathfinder Dam—210 feet high, 205 feet long at crest, 55,000 cubic yards masonry required.

(From "The Review of Reviews"—Issue of June, 1908.)

One hundred and eighty big sluices, near the bottom of the Assouan dam, are always left open during the high water period, so that the mud can pass on and perform its mission of fertilizing the lower plains, just as it has always done in our Mississippi and other valleys. When the mud has passed, the sluices are closed and the clear water is caught and held above the dam, and, when needed, gradually released into ir-

rigation ditches and conducted through them over the fertile plains where no rain falls and irrigation is necessary.

PANORAMIC VIEW FROM POINT ON HIGH-LINE ROAD, JUST BELOW ROOSEVELT DAM SITE, SHOWING RIVER PROJECT.

Looking directly north up the River into the Reservoir site, showing dam site and high-line road.

Roosevelt dam to be 280 feet high, length of crest, 630 feet, cubic contents, 34,000 cubic yards.

Other great dams, built to store water for irrigation purposes, are now under construction in our Western deserts where there are narrow canyons in the solid rock mountains. One of these, named for our

DAM SITE IN CANYON, SHOSHONE PROJECT.

This dam to be 325 feet high, and only 200 feet long at the crest.

ex-President, is to be two hundred and eighty feet high, but it is to be built in a narrow rift in the solid rock mountains and will be only 630 feet long at the top. It will probably cost three or four million dollars, but it furnishes no precedent for Mr. Leighton's dams, most of which are to be built across wide alluvial valleys where bed rock is far below the surface and where the gently sloping hillsides will make the dams of immense length at the crest. The Shoshone dam in the same desert region is to be 325 feet high, but its length at the crest will be only 200 feet. (See illustration.)

GENERAL VIEW OF THE PATHFINDER DAM LOOKING UP THE CANYON OF THE NORTH PLATTE RIVER.

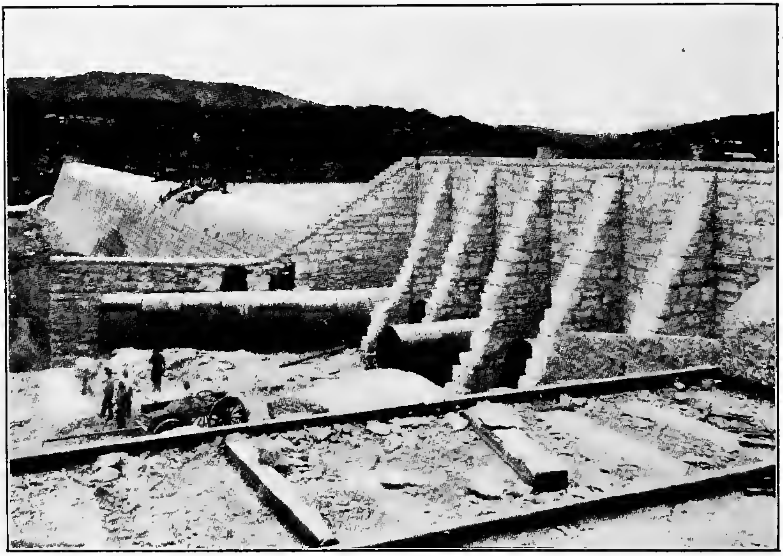
(The dam when completed will reach to the top of the canyon.)

Pathfinder Dam—210 feet high, 205 feet long at crest, 55,000 cubic yards masonry required.

(From "The Review of Reviews"—Issue of June, 1908.)

But whatever difficulties there may be about making other features of the Leighton-Roosevelt plan effective, there can be no doubt that dams built as they propose, would stop and hold immense quantities of rich alluvial soil, washed from the mountain sides, and prevent its being spread out over the surface of the lower valleys. In 1893, a great dam was completed across the Colorado River, at Austin, Texas. It was sixty feet high and about 1,100 feet long, at the crest. Measurements taken seven years later showed that it had, in that brief period, accumulated 40,096,000 cubic yards of silt, (see House Document 106,

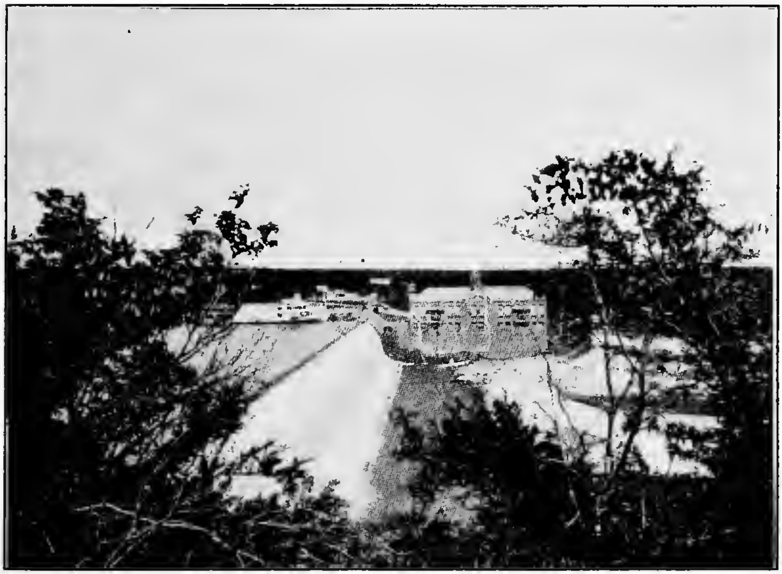
Fifty-sixth Congress, second session), and was nearly half full. Had the process gone on at the same rate it would have been full a year ago; but, like many other similar structures, it was "carried out by a flood, April 7, 1900, with great loss of life and property." Mr. Leighton's dams, for conserving our mud supply, would not be quite so effective as the Austin and other solid dams have proven to be, because, though he would have his sluices closed during high water periods so as to



AUSTIN DAM, COLORADO RIVER OF TEXAS.
Laying the last stone, May 2, 1893.

catch the sediment, yet he proposes to open them slowly, after the water has been clarified by sedimentation, and doubtless he would then lose a small part of the precious accumulation from near the sluices; but faults and weaknesses may be detected in every human device. Within a few decades after completing the dams, the reservoirs would not contain much water, and they could not retain the "enormous but unmeasured amount of earth-salts and soil matter carried in solution," about which Mr. Roosevelt is so much concerned, but they would certainly be depositories of "the greater part of the sediment and soil-matter which are composed of the most fertile material of the fields and pastures drained by the smaller and larger tributaries."

Fifth. Danger. Mr. Leighton adverts, with lofty scorn, to the suggestion that reservoirs, such as he proposes, might be dangerous. He compares the danger to that encountered in a "morning stroll." He says, "life itself is hazardous" and, "every piece of construction made by man is liable to failure." Just so, precisely, but then some works are much more liable to failure than others. In a "morning stroll" along Pennsylvania avenue, Mr. Leighton might be in danger of stubbing his toe, but in a morning stroll through a pasture inhabited by a mad bull, he probably would not tarry to philosophize about "life itself being haz-



AUSTIN DAM, COLORADO RIVER OF TEXAS.
View of dam looking East toward power house.

ardous." Practical men judge a tree by its fruits. No amount of assurance can convince a rational being that a loaded pistol is not dangerous, because experience has proven the contrary. What has been the experience of the human family as to the safety of great dams and storage reservoirs?

We have not attempted to look up full records as to American experience in regard to dam failures, but we have statistics collected by Mr. Henry G. Granger, Mem. Am. Institute Mining Engineers, that give names and dates of destruction of sixty important dams that have

failed in America—fifty-eight of them in the United States, and sixteen of them reservoirs—within the past thirty-six years. Mr. Granger says that he took the list principally from a paper prepared by President Hill of the American Water Works Association, in 1902, and that "Mr. Hill says forty-eight other failures came to his notice, but are not included." The list is as follows:

VIEW OF WRECKAGE OF CITY DAM (LOOKING NORTH), FERGUS FALLS, MINN., SEPT. 24, 1909.
(From Engineering News, October 14, 1909.)

1. Camden, N. J., reservoir, 1902.
2. Austin, Texas, dam, 1900.
3. Middleford, Mass., dam, 1901 (?).
4. Victor, Cal., May, 1901.
5. Lebanon, Ohio, July, 1882.
6. Utica, dam, September, 1902.
7. Lima, Montana, May, 1894.
8. Avoca, Pa., May, 1892.

9 and 10. Melzingah reservoirs, Nos. 1 and 2 and 10, July, 1897.

11. Walnut Grove dam, Prescott, Arizona, February, 1890.
12. City Reservoir, Grand Rapids, July, 1900.
13. Johnstown, Pa., May, 1889.

14. Rock Springs, Blairtown, Wyo., February, 1888.
15. Wilmington, Del., reservoir, October, 1900.
16. East Liverpool, Ohio, October, 1900.
17. Ansonia, Conn., November, 1894.
18. Gennison, Cal., May, 1890.
19. Staffordville, Conn., March, 1877.
20. Lancaster, Pa., October, 1894.
21. Portland, Me., August, 1893.
22. Spring Lake, R. I., August, 1889.
23. Lynde Brook reservoir, Worcester, Mass., March, 1876.
24. City Reservoir, Roanoke, Va., November, 1888.
25. Knoxville, reservoir, May, 1883.
26. Conshohocken, Philadelphia, reservoir, four times, 1873, 1876, 1879 and 1886, all due to settling.
27. Portland, Oregon, reservoir, December, 1894.
28. Roxborough, Philadelphia, reservoir, September, 1893.
29. Queen Lane reservoir, Philadelphia, October, 1894.
30. Light and Power Company, Tacoma, Wash., December, 1892.
31. Housatonic dam, Birmingham, Conn., January, 1891.
32. Dallas, Texas, reservoir, June, 1891.
33. Angels dam, Calaveras county, Cal., April, 1895.
34. Mill River, Williamsburg, Mass., May, 1874.
35. Little Rock, Ark., November, 1887.
36. Mud Pond dam, East Lee, Mass., April, 1896.
37. Vernon Heights, Oakland, Cal., October, 1896.
38. Scranton, reservoir, October, 1895.
39. Nebraska City, April, 1890.
40. Northfield, Vt., August, 1890.
41. Kingsman-street Reservoir, Cleveland, Ohio, December, 1886.
42. Water Power Company, Des Moines, Iowa, March, 1893.
43. Montreal, Canada, reservoir, 1896 (great leakage).
44. St. Anthony's Falls dam, Minneapolis, April, 1899.
45. Dam No. 2, Mahonoy City Water Power Company, June, 1892.
46. Goodrick Creek, near Baker City, Oregon, June, 1896.
47. Dam of the Lake, Staunton, Va., September, 1896.
48. Dam near Ward Col., July, 1897.
49 and 50. Two dams on Beaver Creek, Ansonia, Conn., March, 1884.
51. Pecos River, Eddy, N. M., August, 1893.
52. Broad Brook, Ellington, Conn., September, 1890.
53. Chambly, Quebec, 1901.

54. Dyer Dam bulkhead, Danielson, Conn., 1901.
55. Oakmont Park, Pa., 1903.
56. Fort Pitt. dam, 1903.
57. Second failure Lake Avalon dam, Carlsbad, N. M., 1905.
58. Arizona Canal dam, Phoenix, 1905.
59. Worcester Water Works, dam, 1876.
60. Hauser Lake dam, Mont., April, 1908.

One would naturally suppose that Mr. Leighton would have gone carefully into the records of such failures before assuring us that "Modern engineering has rendered the reservoir (dams) so safe that,

VIEW OF DAM IN PECOS RIVER, AT CARLSBAD, NEW MEXICO. BEFORE THE FLOOD OF OCTOBER, 1904.

as an agent of violent death, it cannot be placed in the same class with the ordinary morning stroll down the streets of a great city." It seems that when Mr. Leighton wished to make a guess at the probable cost of one hundred tremendous reservoirs he did go into that phase of the matter carefully, and found records of "ninety-seven artificial storage reservoirs of various sizes that had been erected in America, Europe, India and other places, or that have been projected for erection with costs carefully estimated." It is manifest that the number of such great storage reservoirs is quite limited. The Assouan dam and

reservoir in Egypt are probably the only ones in the world at all comparable in magnitude with some of those that he proposes to build in the Ohio Valley, but smaller ones have been erected. Certainly there is not a dam on earth 252 feet high and several thousand feet long at the crest.

In a paper prepared by Mr. Leighton and published in the "Engineering News," June 11, 1908, we find the following statement as to the failure of great reservoir dams in America, during the past thirty-four years:

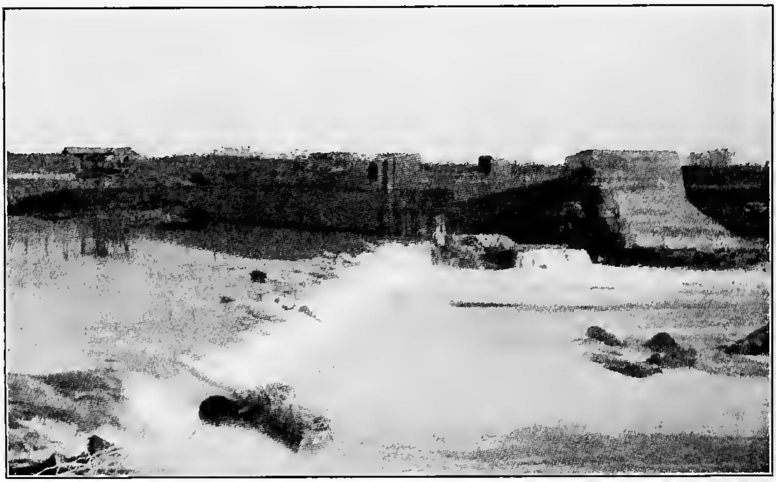
AUSTIN DAM, COLORADO RIVER OF TEXAS.
View westerly along line of dam, one day after failure.

"These failures are:
Williamsburg, Mass., 1874—140 dead.
Johnstown, Pa., 1889—4,000 to 10,000 dead.
Walnut Grove, Arizona, 1890—129 dead.
Oakmont Park, Pa., 1903—50 to 75 dead."

He fails to mention "The great dam in Colorado River of Texas, at Austin, which was built in 1890-1893 and carried out by a flood April 7, 1900, with great loss of life and property" (see House Document No. 106, Fifty-sixth Congress, second session), and he could not foresee

the failure of the dam in Savannah River, at Augusta, Georgia, that wrought such havoc, a few months after he published the data above quoted. Since we have no reliable information about the destructive effects of the last mentioned failure, we will ignore it for the present.

Neither can we blame Mr. Leighton for failing to foresee that the city dam, at Fergus Falls, Minnesota, would fail on September 24, 1909, and that the result would be the failure, in rapid succession, of three other dams, lower down, in the same stream. Yet this calamity has happened within tne past sixty days.



VIEW OF DAM IN PECOS RIVER, AT CARLSBAD, NEW MEXICO.
AFTER THE FLOOD OF OCTOBER, 1904.

It appears then that out of a total of ninety-eight great storage reservoir dams—built and planned—in the whole world, five have failed in the United States alone, within thirty-four years. The frightful effects of these failures have horrified the world. It further appears that fifty-four other important dams—twelve of them reservoirs—have failed in the United States within the past thirty-six years, about which accurate records are at hand, and that, furthermore, there are known to have been at least forty-eight other failures, about which records are not so readily available. Would there be no danger of failure if we should proceed to build one hundred new ones—many of them of vastly greater magnitude than any yet attempted on earth—all of them within a few hundred miles of Charleston, South Carolina,

where an earthquake occurred only twenty-one years ago (1888), which shook the Appalachian Mountains and was felt throughout the Mississippi Valley? Would there be no danger in building one hundred of these tremendous potential agencies of destruction within the limits of the great valley in which an earthquake occurred in 1811, of which the following description is taken from a history of Kentucky:

"At 2 o'clock in the morning of December 16, 1811, was felt the first destructive shock of the great earthquake on the Mississippi River. * * * After shaking the Mississippi Valley to its center, and

WRECK OF THE CITY DAM AND POWER HOUSE, FERGUS FALLS, MINNESOTA, SEPTEMBER 24, 1909.

Three other dams below this one failed in rapid succession, as a result of the first collapse.

(From Engineering News, October 14, 1909.)

extending its vibrations all over the valley of the Ohio, to Pittsburg and beyond, it passed the Alleghanies and their connecting mountain barriers, and died away along the shores of the Atlantic Ocean. During the continuance of this appalling phenomenon—which commenced by distant rumbling sounds, succeeded by discharges as if a thousand pieces of artillery were suddenly exploded—the earth rocked to and fro; vast chasms opened, whence issued columns of water, sand and coal, accompanied by hissing sounds, caused perhaps by the escape of pent up steam; while ever and anon flashes of electricity gleamed

through the troubled clouds of night, rendering the darkness doubly horrible. The current of the Mississippi was driven back upon its source with the greatest violence for several hours in consequence of an elevation of its bed, etc. * * *

"The day that succeeded this night of terror brought no solace in its dawn. Shock followed shock; a dense black cloud of vapor overshadowed the land, through which no struggling sunbeam found its way to cheer the desponding heart of man, who, in silent communion with himself, was compelled to acknowledge his weakness and dependence upon the everlasting God. Hills disappeared and lakes were formed in their stead; numerous lakes became elevated ground, over the surface of which vast heaps of sand were scattered in every direction; in many places the earth for miles was sunk below the general level of the surrounding country, without being covered with water. * *

"One of the lakes formed is sixty or seventy miles in length and from three to twelve in breadth; in some places very shallow, in others from fifty to one hundred feet deep."—Z. F. Smith, History of Kentucky, page 460.

It is further stated that twenty-seven distinct and violent shocks were felt, during the first night of this terrible disaster, and that the shocks and earth tremors continued with decreasing violence until in February, 1812—about two months.

Reelfoot Lake, in Western Tennessee, to which much attention has recently been attracted by the lawlessness of the people living in its vicinity, is one of the results of the earthquake of 1811.

It seems that we must modify what we have said, in commendation of Mr. Leighton's dams as mud collectors. It is morally certain that such dams would fail from time to time—two or more at once, where several are located in the same valley—and that we should then have a stupendous mass of water and mud, intermingled with thousands of dead bodies of men and dumb creatures, rushing headlong towards the Gulf. A "morning stroll" across the fields at Gettysburg, forty-five years ago, might have been more hazardous than living in a valley below one of Mr. Leighton's reservoirs, but such a stroll in a bull pasture were mere child's play in comparison.

Sixth. Cost. We now come to the most astounding feature of the reservoir scheme. We have found that it could not provide water for navigation; that it could not prevent floods; that it could not, under the conditions imposed, provide any valuable water power; that it could not even be relied on to permanently conserve mud; and that no man's life or property would be safe in the valleys below such terrible potential agencies for destruction. Now as to the cost of it.

Mr. Leighton tells us that it is impossible to estimate accurately the cost of building such reservoirs, without making surveys and securing much data. To this we readily assent. He proceeds, however, to state that he finds that "ninety-esven artificial storage reservoirs of various sizes have been erected in America, Europe, India and other places, or which have been projected for erection, with costs carefully estimated," showing that such reservoirs cost about $20,775 per second-foot yield. This rate applied to the amount of water that his one hundred reservoirs would contain (we presume he means when first completed and before they have begun to perform their chief function of catching mud) would give a total cost of $125,219,000.00.

The admirable features of an estimate of this kind are its simplicity and its inexpensiveness. If a Kentucky mountaineer should wish to "estimate" the value of a farm on Manhattan Island, he might proceed to make inquiry as to the current prices of farms "furninst the Hatfield Cove," "beyant the Big Black Mountain" and along the rocky slopes of "Troublesome," "Kingdom Come" and "Hell for Sartin" creeks, and reach the conclusion that, if the timber had been removed, and mineral rights sold to "furriners," and the "blockade" distillery sites made too public for further profitable operation, he could probably buy a one hundred acre farm down near the Battery, for $1,000—"allowin'" to throw in his collection of "coon skins, and wait until the "growin'" crop had been removed. Manifestly, such a calculation would lead to erroneous results, but the process would be beautifully simple and inexpensive—just like Mr. Leighton's reservoir estimate. A youthful or half-witted mountaineer should not be judged harshly for making such a blunder.

Owing to the perfectly manifest impracticability of flooding immense areas of valuable agricultural or mineral territory, studded with towns and villages, mills and homes, orchards, gardens and vineyards, cemeteries and churches, reasonable and practical men do not attempt to flood large territories, except in remote and barren mountain or desert regions. Even in such remote and barren districts, few such reservoirs have been found practicable, owing to the prohibitive cost of dams. The high dams that have been constructed have, with few exceptions, been placed at phenomenally narrow places in deep canyons among the solid rock hills. There are a few localities, with vast reaches of natural lake and swamp territory, such as the site of Lake Winnibigohsish, near the head of Mississippi River, and the artificial lakes thta have been formed at the head of the Volga and Mtsa Rivers

in Russia, where a low crib or earth dam may be built that will flood an immense area of a worthless wet or swamp region. There are no such sites in the Ohio River basin, and the engineers of the Army Corps report that there are no more such sites available in the basin of the upper Mississippi River, or in the basin of the Missouri River. To base an estimate of the cost of one hundred reservoirs in the populous and fertile Ohio River basin, on the cost of such dams as these, or on the cost of the high dams that have been built in narrow rifts in soled rock mountains, in remote desert territory, even though the little Cro-

LOOKING UP THE NORTH PLATTE RIVER, FROM THE TOP OF THE CANYON, AT THE PATHFINDER DAM, SHOWING RESERVOIR.

Pathfinder Dam,—length at crest, 205 feet; height, 210 feet; cubic contents, 55,000 yards.

ton reservoir be included, is manifestly absurd; and it seems that the conclusion reached by Mr. Leighton is about as far afield as would be the conclusion reached by our mountaineer friend, above suggested by way of illustration.

Basis of Estimates.

The question that first presents itself, in trying to determine the probable cost of this enterprise is: On what basis shall we proceed? A corporation acting under a charter, giving it the power of eminent

domain, would naturally and properly seek to secure the property required for its purposes at the lowest figure at which it could be honestly obtained, under conditions existing at the time; expecting to become the beneficiary of any subsequent increase in value.

Would this be the position of the government, in seeking to secure property for a purpose that would destroy its inherent value for the uses to which it might otherwise be devoted? Obviously, no. The broad-minded statesmen, representing the government, would weigh the advantages and disadvantages of any proposition as to its effect on **"The Greatest Good of the Greatest Number,"** both for the present and future. We have been considering some of the alleged advantages to be derived from such reservoirs and find them preposterous. We have considered briefly one of the most manifest disadvantages—the moral certainty that, from time to time, some of these vast dams would fail and cause a destruction of life and property only comparable with the ravages of great wars. Now, what would be the damage to the people of the Nation resulting from flooding and permanently destroying great areas of our most fertile alluvial valleys, of our richest mineral territory, some of which, where railroads have been built, is now selling at from $1,000 to $1,500 per acre; where natural gas and crude oil underlie the country; where millions of acres of such lands, not actually destroyed, would be rendered inaccessible or accessible only at tremendous cost? Would a statesman, considering the destruction of such property, estimate its value to the Nation at the figure at which it might be purchased today, from an ignorant mountaineer? If a true statesman were considering the purchase of such property, to be held or improved for the future use of the citizens, he would order that its present market value should be paid; but in the case that we are considering the purchase would be made for the express purpose of making a use of the lands that would forever destroy their value for agricultural uses, and for mineral products, and would also render inaccessible, except at stupendous cost, vast additional areas of coal, oil and gas territory. A diamond merchant might be able to obtain a rough diamond from an ignorant South African Negro in exchange for a few brass gewgaws, but he would value the stone in accordance with the price he would expect it to bring when taken to market and properly cut and polished. The question, then, is not, "What would the lands cost now?" but "How much of the Nation's wealth would be destroyed in flooding rich agricultural territory, and cutting off from the markets of the future, vast areas of oil, gas, coal and other mineral lands?"

Inasmuch as we are not seers, it is impossible to determine what the loss to the Nation would be, valued at the prices of the future, but it would be manifest folly for the statesman to estimate the value of coal in the mountains of Kentucky, Tennessee and West Virginia at figures lower than that now being paid for similar coal along the railroads in Pennsylvania.

Coal rights in Pennsylvania are now selling for over $1,250 per acre. Where such territory also includes rich alluvial bottoms, their value is $1,500 per acre. Where there is both coal and oil or gas, the value sometimes becomes several thousand dollars per acre. In the

PROPOSED DAM SITE, FRENCH BROAD RIVER,
EAST OF KNOXVILLE, TENN.

Dam to be 200 feet high, about 0.65 mile long, submerged area 71,000 acres. Position of dam indicated by arrows. Land held at $100.00 to $150.00 per acre, "but is not for sale."

following estimates, I have placed values at prices at which similar properties are now selling, where transportation lines have been built, believing that the demagogues who have temporarily checked the development of our National wealth will soon lose their power for evil. The actual value of our coal lands will, within a generation, probably be far greater than I have assumed. If there were any truth in the preposterous statements now current, regarding the exhaustion of our National resources, the value of coal lands would be, immediately, vastly greater than I have assumed in the estimates.

During the past twenty-eignt years I have been building and locating railroads in various portions of the Ohio River basin. I have seen

coal lands, in West Virginia, advance in value from two dollars an acre, where remote from railroads, to $1,000.00 per acre, after railroads were built and other improvements made. I have seen lands valued at $100 per acre, for farming purposes, increase in value to $2,500.00, or more per acre, where oil or gas has been discovered. Last year I visited the sites of a number of the reservoirs that Mr. Leighton proposes and I find that everywhere values have advanced at an astounding rate.

I agree with Mr. Leighton that it is impossible to make a reliable estimate of the cost of any one of his proposed reservoirs without sur-

PROPOSED DAM SITE, LITTLE TENNESSEE RIVER, LOUDON COUNTY, TENN.

Dam to be 100 feet high, about 0.75 mile long. The area which would be submerged, 54,400 acres. The dam would extend from the hill on the right indicated by an arrow to the hill on the left which is hidden by trees on this picture.

veys; but it is manifestly entirely possible to determine that certain items of cost must be included in the total. For instance:

Tennessee River Valley.

Little Tennessee River, Loudon County, Tennessee.

Mr. Leighton proposes to construct a dam one hundred feet high, across the Little Tennessee River in Loudon county, Tenn. The figures that he gives as to height of dam, drainage area and flooded area place the site of this dam a few miles below the point at which the new

Louisville & Nashville low-grade, Cincinnati-Atlanta railroad crosses that river. In the year 1904, I purchased for that company 17.31 acres of land near the site of their new bridge, across that river, for $4,000.00, or $233.00 per acre, and was glad to get it at that price, because I believed that if we had attempted to condemn it we should have been forced to pay more. The land purchased was no better nor more valuable than thousands of similar acres lying along the river bottoms above and below the bridge site. The dam proposed by Mr. Leighton would, according to his estimate (which I find about correct) actually flood 54,400 acres of this territory, including the beautiful Tellico Plains,

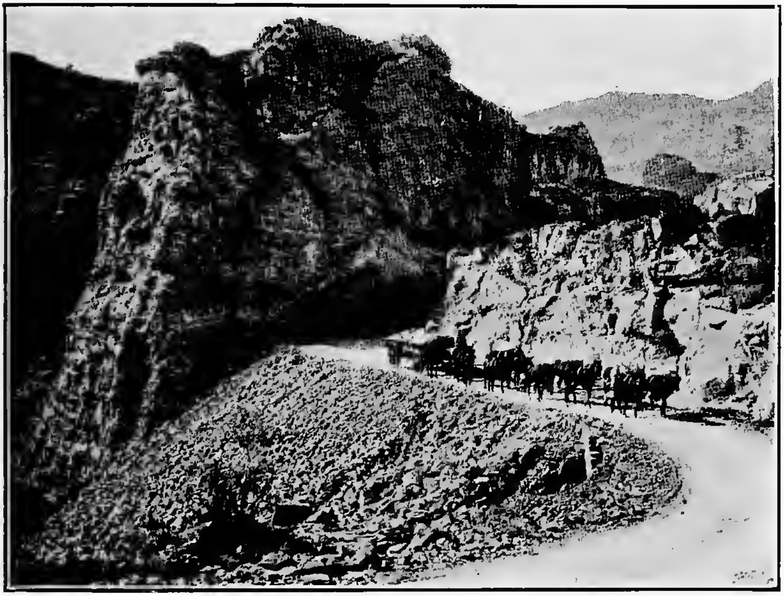
LOUISVILLE & NASHVILLE RAILROAD BRIDGE, LITTLE TENNESSEE RIVER.

This bridge and many miles of track, both Louisville & Nashville and Southern Railway, would be entirely submerged by the proposed reservoir. The farm land is held at a high figure. A new bridge for the Louisville & Nashville to cross proposed reservoir would occupy position indicated by arrows and would be over 100 feet high and about one mile long.

where large lumber manufacturing plants have been established. A glance at a contour map shows that the area actually flooded would be only a portion of the land that would be ruined. The water would flood the bottoms along all the larger and smaller tributaries, and cut off many thousands of acres, situated on the low ridges lying between the creeks and branches. It is evident that the government would find it necessary to buy about 50 per cent more land than would be actually flooded. This would make the total area to be acquired for this one reservoir 81,600 acres. When we consider that most of this area would be extremely fertile alluvial bottom land, of an intrinsic value of about $200.00 per acre; that the flooded territory would include villages,

dwellings, orchards, vineyards, gardens, water power dams, manufacturing plants and lumber mills, graveyards, churches and old homes; and that the highest possible price is always expected and demanded when the government is the purchaser, it would seem folly to hope to secure this property at a cost averaging less than $200.00 per acre for the flooded area, and $50.00 per acre for adjoining timber and farm lands.

Here, then, we have items of cost for this reservoir of 54,400 acres of land at $200.00 per acre=$10,880,000, and 27,200 acres at $50.00 per



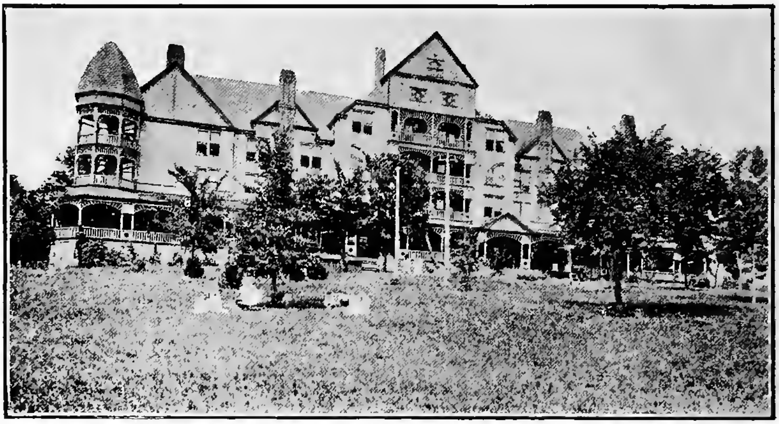
A PORTION OF THE GOVERNMENT ROAD ALONG THE CANYON OF THE SALT RIVER FROM THE MESA TO THE ROOSEVELT DAM.

(Portions of this road cost $25,000 per mile to build.)
(From "The Review of Reviews"—Issue of June, 1908.)

acre=$1,360,000. The construction of this reservoir would destroy about 200 miles of public road. It is useless now to attempt to estimate the whole cost of rebuilding these roads. Much of that destroyed could not be rebuilt at all. Such portions as could be rebuilt would of necessity be placed far up on the rough mountain slopes. The hollows and ravines being filled with water, a great number of bridges would be required, and the conditions would call for masonry piers and steel

spans. If we assume that it would be possible to rebuild one hundred miles of highway at $20,000 per mile, we would have a cost of $2,000,000 for highways. Portions of the wagon road built to reach the Roosevelt dam have cost $25,000 per mile, though constructed for temporary use, whilst the dam was being built. It is impossible now to estimate the damage that would be done to the slate deposits located along the river above the dam, which are said to be of great extent and value, and which would be flooded or rendered inaccessible.

It is impossible to estimate the damage that would be done to property holders in Monroe, Loudon and Blount counties, if they should be



HOTEL AT TATE SPRINGS.

The proposed reservoir on the Holston River would flood this well-known resort.

cut off from railroads and markets by having the little creeks and branches converted into deep and wide lakes; but doubtless a thousand claims would be made and endless costly litigation would ensue.

The proposed reservoir would flood about fifteen miles of the new Cincinnati-Atlanta Division of the Louisville & Nashville Railroad. This road was finished four years ago with low grades, light curves, heavy rails, stone ballast, steel and masonry structures throughout, and is believed to be one of the best built railroad lines South of the Potomac River. It would also submerge about ten miles of the new low-grade line, hardly yet completed, of the Southern Railway, along the Little Tennessee River; and about two miles of the Tellico Railway.

The water in the reservoir would be about ninety feet deep and 4,000 feet wide at the narrowest accessible place at which a new bridge could be built for the Louisville & Nashville crossing of the river.

It would be necessary to build piers about 125 feet high to support the new bridge spans, and the whole structure would cost about $1,-300,000. All the railroads destroyed would necessarily have to be rebuilt high upon the mountain sides, with steel and masonry structures crossing the side creeks and ravines, which would be converted into formidable deep-water estuaries. The advocates of waterways constantly quote Mr. Jas. J. Hill as authority for estimating the cost of

TATE SPRINGS.
Would be flooded by proposed Holston River Reservoir.

increasing our railroad mileage, at $75,000 per mile, and under the conditions above described the cost would be about that sum, not including the big bridge over the main river channel for the Louisville & Nashville Railroad. For railroad changes we have, then, an estimate of twenty-seven miles rebuilt at $75,000=$2,025,000, and one huge steel and masonry bridge at $1,300,000. Mr. Leighton proposes to make the dam one hundred feet high, measured from the present surface of the valley. The river bottoms at the proposed site of the dam are of rich black alluvium, of unknown depth. To make a dam one hundred feet

high, safe and stable, it would be necessary that the foundation be on solid rock. Possibly such a foundation might be had here at a depth of thirty feet, but it would be unsafe to assume less than forty, and it might be found necessary to go much deeper. The dam would probably be at least one hundred and forty feet high. It would be about 3,200 feet long at the crest, about nine hundred feet long at the base and would probably contain about 700,000 cubic yards of concrete masonry which, at $7.00 per cubic yard, would cost $4,900,000. Besides this, there would be immense costs for foundation excavation, coffer dams, or caissons, metal in sluices and gates, etc., all of which we are now unable to estimate. The items of cost for which we can make a partial estimate are as follows:

54,400	acres of land, $200 per acre	$10,880,000.00
27,200	acres of land, $50 per acre	1,360,000.00
100	miles of public highway, $20,000 per mile	2,000,000.00
1	railroad bridge, 4,000 feet long	1,300,000.00
27	miles of railroad at $75,000 per mile	2,025,000.00
700,000	cubic yards of concrete at $7 per cubic yard	4,900,000.00
	Total	$22,465,000.00

This one reservoir, in a farming district, would cost at least $24,000,000.00.

Hiwassee River, Near Mouth.

Mr. Leighton proposes to build another dam in the Hiwassee River below the point at which the Knoxville and Chattanooga Division of the Southern Railway crosses that river. Here, conditions as to value of land to be flooded, are similar to those found in the valley of the Little Tennessee River, except that in this case the towns of Calhoun and Charleston would be wholly destroyed, and Benton, the county seat of Polk county, would be cut off from communication with the rest of the world. The water in this reservoir would submerge 70,000 acres of land, worth $200.00 per acre, and destroy the value of about 35,000 acres in addition, worth $50.00 per acre, making a total of 105,000 acres deducted from the Nation's agricultural area. It would submerge about thirteen miles of the Cincinnati-Atlanta Division of the Louisville & Nashville Railroad and about five miles of the Southern Railway, above mentioned. It would destroy about two hundred miles

of wagon roads and highways of which, perhaps one hundred could be rebuilt by constructing a large number of long and high steel and masonry bridges and viaducts. The dam would be about seventy feet high, measuring from the surface of the ground, perhaps one hundred and ten feet or more from bed rock; about 2,000 feet long at the crest, five hundred feet long at the base, and would probably contain about 260,000 cubic yards of concrete masonry.

FARM LAND ON FRENCH BROAD RIVER.

Would be overflowed by proposed reservoir. Land held at $100.00 to $150.00 per acre, "but is not for sale."

A partial estimate of the cost of this reservoir is as follows:

70,000 acres of land at $200	$14,000,000.00
35,000 acres of land at $50	1,750,000.00
100 miles of highway at $20,000	2,000,000.00
2 railroad bridges	1,000,000.00
18 miles of railroad at $75,000	1,350,000.00
260,000 cubic yards concrete masonry at $7	1,820,000.00
Total	$21,920,000.00

Again, we are unable to make any estimate of the cost of foundation excavation, coffer dams, metal in sluices and gates, etc. Neither can we estimate the damage to the large timbered territory lying east of the flooded country in Beans and Frog Mountains, which are also believed to contain immensely valuable deposits of copper ore. All this territory would be cut off from communication with the balance

of the world and rendered inaccessible to railroads, except at immense cost for construction. This one reservoir would probably cost about $23,000,000.00.

The two proposed reservoirs above estimated for, are in the basin of the Tennessee River. We will consider one of those in the Cumberland River Basin, one in the Kanawha basin, one in the Big Sandy basin, and two in the Monongahela basin.

Cumberland River.

Dam at Williamsburg, Ky.; 82 feet high, from surface of ground.

Length at top, about 1,800 feet; at base, about 600 feet.

Area submerged, 33,500 acres.

Additional land, 16,500 acres.

Total, 50,000 acres.

About 20,000 acres bottom land, at $200 per acre.

40,000 acres coal land, at $1,000 per acre.

30,000 acres rough timber land, at $25 per acre.

Louisville & Nashville R. R., Cincinnati-Atlanta Division	12 mi. submerged
Louisville & Nashville R. R. Branch, Jellico to Halsey	5 mi. submerged
Louisville & Nashville R. R. Branch, Jellico to Saxton	3 mi. submerged
Louisville & Nashville R. R. Branch, Kensee spur	1 mi. submerged
Louisville & Nashville R. R. Branch, Pine Mountain	17 mi. submerged
Louisville & Nashville R. R. Branch, Pine Mountain	8 mi. submerged
Louisville & Nashville R. R., Cumberland Valley Division	8 mi. submerged
Louisville & Nashville R. R., Greasy Creek	3 mi. submerged
Total	57 mi.

Southern Railway, Knoxville to Jellico	4 mi. submerged
Southern Railway, Indian Creek	1 mi. submerged
Southern Railway, Cumberland Railroad	6 mi. submerged
Total	11 mi.

Total submerged	68 mi.
Additional miles of railroad reconstruction required on account of grade changes..........	10 mi.
Total railroad mileage to be rebuilt........	78 mi.

Seventy-eight miles of railroad, built along the steep (sometimes perpendicular), rocky, mountain sides, crossing many creeks flowing through wide bottom lands that would, under the conditions, be converted into lakes and require steel bridges on masonry supports, would cost about $150,000 per mile, average, not including a bridge ninety feet high and about 3,500 feet long for the Cincinnati-Atlanta Division of the Louisville & Nashville Railroad, at Williamsburg, which would cost

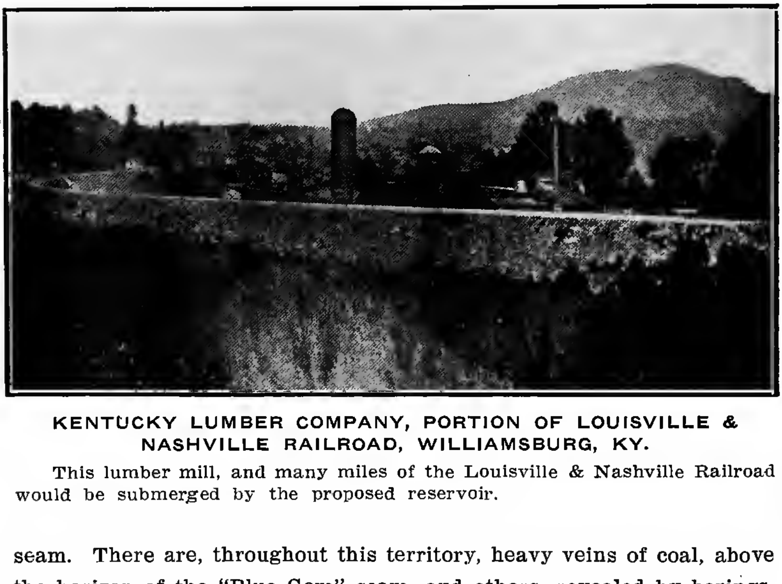
DAM SITE, PROPOSED, LOOKING DOWN CUMBERLAND RIVER, WILLIAMSBURG, KY.

Dam to be 82 feet high, about 0.50 mile long. Submerged area 33,500 acres. Position of dam shown by arrows.

x Rich bottom land, shown as hill on topographical map.

about $1,200,000. The whole territory adjacent to the proposed reservoir is underlaid with immensely valuable veins of coal, similar to coal lands in Pennsylvania, now selling for $1,000.00 per acre. By building cheap spurs from the existing railroads, all this territory can now be reached with inexpensive rail lines. If the territory were flooded, the existing railroad would have to be rebuilt high upon the mountain slopes on one side of each valley, and in order to obtain access to the coal on the other side of the waters it would be necessary to build another line along the mountain slopes on the opposite side of each of the valleys, or else lose thousands of acres of coal at a time

when Mr. Leighton tells us that the total supply is sufficient to last only seventy years, at the present rate of consumption. If Mr. Leighton be correct, this land will soon be worth $1,500 to $2,500 per acre. Perhaps it were better to estimate for an additional railroad along the opposite sides of each valley. This would include about 100 miles of line, at $150,000 per mile. The out-crop of the "Blue Gem" seam of coal is low down in the hills in this territory, and all the mines in that seam now being worked would probably be cut off or flooded and put out of business. This vein is only thirty to forty inches thick, but the coal is regarded as the finest in Kentucky, for domestic uses. We cannot estimate the damage that would result to the operators in this coal



KENTUCKY LUMBER COMPANY, PORTION OF LOUISVILLE & NASHVILLE RAILROAD, WILLIAMSBURG, KY.

This lumber mill, and many miles of the Louisville & Nashville Railroad would be submerged by the proposed reservoir.

seam. There are, throughout this territory, heavy veins of coal, above the horizon of the "Blue Gem" seam, and others, revealed by borings, that underlie the whole territory.

The dam above described would probably be 125 feet high and contain about 500,000 cubic yards of masonry. The town of Williamsburg, which stands just below the proposed dam site, has a population of about 2,100. With such a dam towering above the town, and with the railroad moved across the river, and rebuilt high upon the side of the perpendicular bluffs, the town would eventually be abandoned. The total value of the property is now about $1,000,000. The immediate damage would probably be about $500,000.00, but we will not include

this in the estimate. The large mills of the Kentucky Lumber Company, just above Williamsburg, would be flooded in water some sixty feet deep, but are not included in the estimate, because most of the plant could be removed, though at a heavy cost.

Omitting any effort to estimate the cost of coffer dams, damage from high water during progress of construction, metal in sluices, gates, etc., damage to flooded coal mines, damage to a number of villages like Saxton, Pleasant Valley, Barboursville, Jellico, etc., etc., that would be submerged wholly or in part, we have for our partial estimate the following items—the price of lands being placed at their probable future value to the Nation:

20,000 acres bottom land, at $200 per acre	$4,000,000.00
40,000 acres coal land, at $1,000 per acre	40,000,000.00
30,000 acres rough, partially timbered land, at $25 per acre	750,000.00
78 miles railroad, rebuilt at average cost of $150,000 per mile	11,700,000.00
75 miles public road, rebuilt at average cost of $20,000 mile	1,500,000.00
100 miles railroad, rendered necessary in order to reach coal lands cut off by water, at $150,000 per mile	15,000,000.00
1 railroad bridge, 3,500 feet long, piers about 110 feet high	1,200,000.00
500,000 cubic yards concrete masonry, at $7 per cubic yard	3,500,000.00
Partial estimate of cost	$77,650,000.00
Probable cost to the people of the Nation	$80,000,000.00

Kanawha River.

Coal River, Kanawha county, West Virginia.

Dam, 128 feet high, 2,300 feet long at crest and 600 feet at base.

Probable height necessary for stable foundations, 165 feet.

Probable contents, about 800,000 cubic yards.

Total area flooded, 20,800 acres.

Area to be purchased, 31,000 acres.

Of this, about 15,000 acres are bottom land, valued at $200.00 per acre; 17,000 acres coal land, at $1,000.00 per acre; 16,000 acres partly

timbered mountain land, at $25.00 per acre. Length of the Chesapeake & Ohio Railroad, along Coal River, submerged, thirty miles. Length of railroad required to make connection with main line of Chesapeake & Ohio Railroad in order to get above a dam 128 feet high, with a five-tenths per cent (.5 per cent) grade, five miles. The length of railroad required to reach coal lands along both sides of the Coal River Valley would be double the length above mentioned, but would be necessary unless thousands of acres of valuable coal be abandoned (it must be borne in mind that the scheme calls for a lake through the valley and all its tributaries, which would be about one mile wide and 125 feet deep at the dam, and gradually diminish up stream thirty miles). Along this valley the mountain slopes are very steep, the stratification largely of slate, which slides badly when cut into to secure a road-bed for a railroad. The ridges run out to sharp points at their ends, and the tributary branches cut deep into the hills. A line built high up on the mountain side would require a succession of high bridges crossing the estuaries of the proposed lake and a large number of tunnels through the ends of the sharp ridges. Somewhat similar work on the South and Western Railroad (now the Carolina, Clinchfield and Ohio Railway), through the mountains of North Carolina and Kentucky, has cost $200,000 per mile, and it would be unsafe to estimate this at any lower figure. The conditions that would make railroad building costly would also make highway construction costly, and we cannot assume that less than sixty miles of highway rebuilt at a cost of $30,000 per mile would be required. This would give a road parallel with the big lake on either side thereof. The cost of one or more viaducts across the main valley for highways would be prohibitive, and the people would be compelled to put in service ferry boats in order to cross, and there would doubtless be innumerable resulting claims for damage. The cost of building spur line railroads to reach the coal along the tributaries would be immense, though necessary. No effort is made here to include such spur lines in the estimate. To reach coal seams lying at a level below that of the surface of the water, it would be necessary to sink shafts.

The valuable "Black Band" seam of hard coal that is at a low level and extends under much of this territory, would have to be worked in that way, and mines now being worked would probably be flooded and abandoned. The coal land in this territory will probably soon be worth $1,000 per acre. Lands in the Pocahontas coal field, in a territory not far distant, are now valued at from $1,000 to $1,500 per acre. I have

used the figure $1,000 as being the probable value within a few years.

We have, then, for a partial estimate of the cost of this reservoir, the following items:

15,000	acres bottom land, at $200 per acre	$ 3,000,000.00
16,000	acres rough, partly timbered land, at $25 per acre	400,000.00
17,000	acres coal land, at $1,000 per acre	17,000,000.00
35	miles of Coal River Railroad, branch of C. & O. R. R., to be rebuilt at $200,000 per mile	7,000,000.00
35	miles of railroad to reach coal on opposite side of reservoir, at $200,000 per mile	7,000,000.00
60	miles of highway, at $30,000 per mile	1,800,000.00
800,000	cubic yards concrete masonry, at $7 per cubic yard	5,600,000.00
	Total	$41,800,000.00

No effort is here made to estimate the cost of coffer dams, damages from floods, cost of metal in sluices and gates, damages to the town of St. Albans, which has a population of about 1,500, and would be

PROPOSED DAM SITE, COAL RIVER, ST. ALBANS, W. VA. (LOOKING UP RIVER.)

Dam to be 128 feet high, about 0.45 mile long. The dam would extend from hill on left to a hill on the right, which is hidden by trees in this picture. A large lumber plant (almost obscured by smoke in this picture), many miles of the Coal River Railroad, a vast amount of valuable coal land are some of the things which this reservoir would submerge.

right at the foot of a dam 128 feet high; damages to the lumber mills of the Bowman Lumber Company, which would be flooded under about 100 feet of water; damages to coal mines that would be flooded, nor of innumerable other items of unknown or unforeseen cost. The total cost to the Nation for this reservoir would not be less than $44,000,000.00.

Big Sandy River Valley.

Levisa Fork, Lawrence county, Kentucky.

Height of dam, 81 feet; length at crest, about 2,100 feet; at base,

PROPOSED DAM SITE, GAULEY RIVER, FAYETTE COUNTY, W. VA. (LOOKING UP RIVER).

Dam (indicated by arrows), 250 feet high, about 0.45 mile long. The Gauley Branch, Chesapeake & Ohio Railroad, much valuable coal land, etc., would be submerged.

about 800 feet. Probable cubic yards of masonry, 450,000; flooded area, 66,400 acres. Total area required, 100,000 acres; 50,000 acres bottom land, at $200.00 per acre; 60,000 acres coal land, at $1,000 per acre; 50,000 acres rough timbered land, at $25.00 per acre.

Fifty miles of Chesapeake & Ohio R. R. to be rebuilt along the sides of proposed lake, high up on mountain slopes, with many tunnels and bridges, at $150,000 per mile. Fifty miles of similar railroad rendered

necessary on opposite side of lake, unless hundreds of thousands of acres of valuable coal lands are to be paid for and abandoned.

Two three-mile reaches of railroad, with five-tenths per cent (.5 per cent) grade necessary to connect the portion of new lines above dam with the existing track below the dams.

Value of real estate in the three large villages—Paintsville, Prestonburg and Pikesville—each of them a county seat, $1,800,000. Highways along both sides of lake, built along steep and precipitous hills and bluffs, crossing many wide and deep estuaries of the lake, with masonry-steel bridges, 100 miles, at $30,000 per mile. We cannot now estimate the cost of coffer dams, etc. We cannot estimate the increased cost of mining coal from seams lying at a level below that of the top of the proposed dam, which could be reached only by shafts or incline drifts, and in which the cost of mining would probably be greatly increased by water in-filtration from the reservoir. Neither can we estimate the increased cost of constructing branch railroads along the tributary streams to reach the out-crop of the immense coal deposits at points distant from the valley of the Big Sandy River. All the tributary streams would also be converted into deep and wide lakes, with many estuaries to be crossed. The building of the necessary branch lines would be extremely costly. Such lines could probably now be built on the surface of the valley for about $20,000 per mile, average. Under the conditions that would exist, after the reservoir had been constructed, they would probably cost from $75,000 to $100,000 per mile. Many other items of cost cannot be foreseen.

The items for which we can now make an approximate estimate are as follows:

50,000	acres bottom land, at $200 per acre	$10,000,000.00
60,000	acres coal land, at $1,000 per acre	60,000,000.00
50,000	acres rough timber land, at $25 per acre	1,250,000.00
106	miles of railroad construction, at $150,000 per mile	15,900,000.00
3	towns (county seats) destroyed; estimated damage	1,800,000.00
100	miles highways, at $30,000 per mile	3,000,000.00
450,000	cubic yards concrete masonry at $7 per cubic yard	3,150,000.00
	Total	$95,100,000.00

This one reservoir would probably cost the people of the Nation nearly the whole of the amount that Mr. Leighton estimates as the aggregate cost of 100 reservoirs.

Monongahela River Valley.

West Fork River, Clarksburg, West Virginia.

Dam, 109 feet high; length at crest, 1,500 feet; length at base, 300 feet; probable contents, 250,000 cubic yards. Area flooded, 15,900 acres. Area required, 23,000 acres. In this case about 10,000 acres are bottom land, worth $200.00 per acre, and 13,000 acres of hillside and timbered

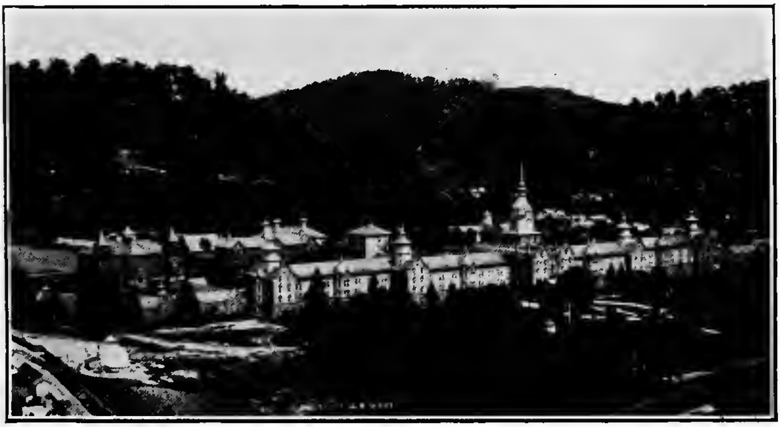
DAM SITE WEST FORK RIVER, CLARKSBURG, W. VA.

Dam to be 109 feet high, 0.25 mile long, would flood 14,500 acres approx. Location of dam indicated by arrows. This reservoir would flood farm, coal, oil and gas lands, valued from $50.00 to $1,000.00 and more per acre.

land, worth $25.00 per acre, would be flooded. The whole territory is underlaid with coal, and many oil and gas wells are in operation in this and adjacent territory. It would be folly to estimate the value to the Nation of the mineral, gas and oil rights at less than $1,500 per acre. A geological map, issued by the State Geologist of West Virginia, bearing date of January 1, 1904, shows the entire territory underlaid with ~~coal,~~ which is believed to be the famous coking coal mined so extensively at Connellsville, Pa. At the time at which the data for this map was collected, nearly five years ago, there were thirteen gas wells

and three oil wells, within the district that it is proposed to flood. I was recently told in Weston, a town of about 7,000 population, within the proposed flooded territory, that lands could not be had in the district for less than $1,500 per acre. This value is, perhaps, now partly fictitious, being based on the supposed extent of oil and gas. I use the figure $1,500 per acre as the probable value, to the Nation, of the mineral, gas and oil under the whole area that it would be necessary to purchase.

The corporate limits of the town of Weston include only about one-half of the town property and population. The actual assessed value



WEST VIRGINIA HOSPITAL FOR THE INSANE, WESTON, W. VA.

This great state institution would be flooded by the proposed West Fork River Reservoir, Clarksburg, W. Va.

of real estate and city property within the corporation, as stated to me by the clerk of the county and city courts, is $1,780,313.89. The value of town property outside the corporate limits cannot be less than 60 per cent of that within said limits, or $1,068,188.33. The actual cost of the State Insane Asylum, as given by an officer thereof, has been $1,777,000. A number of villages would be destroyed, but I did not have time to visit them, and not knowing the value of the property, I do not attempt to include the damages in this estimate.

Jackson's Mill, the birthplace and early home of General "Stonewall" Jackson, would be flooded and destroyed. No attempt is here made to estimate the value that would be set upon this property by the people of West Virginia, of the South, and of the whole Nation. About

twenty miles of the Baltimore and Ohio Railroad would be submerged, and it would be necessary to rebuild it on higher ground. In this instance, rebuilding might be accomplished at a cost of about $60,000 per mile. Many bridges would be required and the conditions would call for masonry and steel structures, but the estuaries to be crossed would be only about forty feet deep, and some of the crossings could be effected with earth and stone embankments. It would be necessary, however, to build a line of railroad along both sides of the valley to reach the coal, oil and gas territory otherwise cut off. This would make necessary about sixty miles of additional railroad line, at a cost of about $100,000 per mile.

WESTON, W. VA. BIRD'S-EYE VIEW FROM TOWER OF HOSPITAL FOR THE INSANE.

This thriving city in the oil and gas belt would be flooded by the proposed reservoir, West Fork River, Clarksburg, W. Va.

A public highway along both sides of the main body of water would be indispensable. Such road would cross many wide estuaries of the lake and could not be built for less than $30,000, per mile, for fifty miles. We should include at least sixty miles of additional highway at $10,000 per mile. The whole territory being underlaid with coal, spur lines of railroad will be required along nearly every considerable creek in the territory. Such lines could now be built at a cost of about $20,000 per mile. With the valleys all flooded (the maximum depth 109 feet), the cost of such lines would probably average $100,000 per mile, but would be necessary unless thousands of acres of coal, oil and gas-

producing territory be wholly abandoned. It is, however, useless to attempt to include the cost of such branch lines in our estimate.

JACKSON'S MILLS. STONEWALL JACKSON'S BOYHOOD HOME.
The dam proposed by Mr. Leighton in the West Fork River, Clarksburg, would make the water about 40 to 50 feet deep at the above place and would destroy this home which is of great historic interest.

The items of cost above mentioned are as follows:

10,000	acres of bottom land, at $200 per acre	$ 2,000,000.00
13,000	acres hill and timbered land, at $25 per acre	325,000.00
23,000	acres of coal, gas and oil territory, at $1,500 per acre	34,500,000.00
	Damage to town of Weston, suburbs and insane asylum	4,625,000.00
20	miles of Baltimore & Ohio Railroad, at $60,000 per mile	1,200,000.00
60	miles of railroad to develop coal, at $100,000 per mile	6,000,000.00
50	miles of highway, at $30,000 per mile	1,500,000.00
60	miles of highway, at $10,000 per mile	600,000.00
250,000	cubic yards concrete masonry, at $7 per cubic yard	1,750,000.00
	Total	$52,500,000.00

The cost and damage to the people of the Nation resulting from the building of this dam could not be less than $55,000,000.00.

Ten Mile Creek, Millsboro, Pennsylvania.

Height of dam, 180 feet; length at crest, 1,600 feet; length at base, 200 feet; probable contents of dam, 580,000 cubic yards of concrete. Flooded area, 6,400 acres. Area required, 9,600 acres. The total area is underlaid by the seam of coal worked at Connellsville, Pa., as shown by geological map, and on that account, alone, the present value of the land is not less than $1,500 per acre, for mineral. Sales have recently been made in adjacent territory at about that figure. A large amount of valuable bottom land would also be destroyed, probably

PROPOSED DAM SITE—TEN MILE CREEK—MILLSBORO, PA.

Dam to be 180 feet high, 0.35 mile long. Water will submerge 6,400 acres. This reservoir would submerge a branch of the Pennsylvania Rairoad, a coke plant of 100 ovens, coal mines and coal lands, villages, farms, highways, etc. Arrows indicate location of dam.

4,000 acres, worth $200.00 per acre. The 5,600 acres of hillside and timbered land is worth $25.00 per acre. The value of coal-mining and gas well property at Besco and Zollansville that would be destroyed is probably about $400,000. About four miles of spur lines of the Pennsylvania Railroad to reach the same territory, effectively, with a five-tenths per cent (.5 per cent) grade line, that company would have to begin building at points on their existing track along the Monongahela River, about five miles above the bridge crossing Ten Mile Creek, and five miles below the same point and build lines ascending along the sides of the bluffs to the level of the top of the dam and then extend these lines along both sides of the valley, crossing ravines at least 150

feet deep and full of water. Such lines would require a large per cent of tunnels. Each line would be about eight miles long, giving a total length of sixteen miles, at a cost of about $100,000 per mile. Some villages would be destroyed, but I do not attempt to include the damage here. In order to make adjacent territory accessible, it would be necessary to build a highway along both sides of the great lake, extending along both forks of Ten Mile Creek. Such a road would be built along the face of steep, rocky mountain sides, with many wide estuaries to be crossed, of a maximum depth of about 130 feet, filled with water. Such a highway could not be built for less than $30,000 per mile, and about fifty miles would be required. It is evident that an immense territory of coal, worth $1,500 per acre, would be cut off

PROPOSED DAM SITE. WHITELY CREEK, MAPLETOWN, PA.
Dam to be 140 feet high, about 0.30 mile long, will flood about 960 acres. Dam to extend from hill on the left in the back ground to hill back of the trees on the right.

from market, unless about sixty miles of railroad should be built—one line along each side of the valley—and along each side of the larger tributaries, with tunnels and high bridges crossing estuaries filled with water of great depth. Such railroads would cost about $200,000 a mile. The gas and oil wells in the territory would all be destroyed, but it is impossible to estimate their value, since the source of supply is unknown. The coal seams in the territory would be so deep under the accessible land that costly shafts would be required to reach the mines. It is impossible to estimate the cost of many of

these things. The items that may be partially estimated are as follows:

9,600 acres of coal land, at $1,500 per acre	$14,400,000.00
4,000 acres bottom land, at $200 per acre	800,000.00
5,600 acres hill land, at $25 per acre	140,000.00
2 coal mining properties	400,000.00
16 miles railroad, at $100,000 per mile	1,600,000.00
60 miles railroad, at $200,000 per mile	12,000,000.00
50 miles highway, at $30,000 per mile	1,500,000.00
580,000 cubic yards concrete, at $7 per cubic yard	4,060,000.00
Total	$34,900,000.00

The costs and damages to the people of the Nation would, in this instance, probably aggregate $36,000,000.00.

Mr. John H. Jones, of Pittsburg, has stated to Major Sibert, of the U. S. A. Engineer Corps, that the damage to his property, alone, that would result from building the Ten Mile Creek reservoir, would be $10,000,000.00. Apparently, a conservative statement.

Summary.

We have now made partial estimates of the cost, to the people of the Nation, of constructing seven of the reservoirs proposed by Mr. Leighton. The results, tabulated, are as follows:

Reservoirs Proposed by M. O. Leighton.	Capacity of Reservoir in 1,000,000 Cu. Ft.	Area of Flow Lines in Acres.	Height of Dam in Feet.	Partial Estimate of Cost and Damage to People of the Nation.
1. Little Tennessee River, Loudon County, Tenn.	78,000	54,400	100	$ 22,465,000
2. Hiwassee River, near mouth, Tennessee	77,500	70,000	70	21,920,000
3. Cumberland River, Williamsburg, Kentucky	41,600	33,710	82	77,650,000
4. Levisa Fork, Big Sandy, Lawrence County, Kentucky	104,722	66,400	86	95,100,000
5. Coal River, Kanawha County, W.Va.	40,580	20,800	128	41,800,000
6. West Fork River, Clarksburg, W.Va.	24,700	15,900	109	52,500,000
7. Ten Mile Creek, Millsboro, Pennsylvania	15,200	6,400	180	34,900,000
	382,302	267,610		$346,335,000

We have, then, as a partial estimate of the cost of these seven reservoirs, a total of $346,335,000. When first completed, and before they

had hegun to fill up with mud, they would have a storage capacity of 382,302 million cuhic feet of water. There would be a reasonable expectation that each of them would he filled with water once in five years. During the remaining years each of them would catch some water, ranging, perhaps, from one-third of their capacity up. It would seem fair to assume an average of sixty-six per cent (66 per cent). This would give 252,300 million cuhic feet of water, at a cost of $346,335,000 and a unit cost of $1,372.71 per million cubic feet. This is a much lower unit of cost than that resulting from experience in constructing the Croton and Ashokan reservoirs (see paper by Major H. C. Newcomer, in "Engineering News," October 8, 1908), where the actual cost per million cubic feet capacity, has been $1,800 and $1,600 respectively, but our estimates do not include a large number of items, suggested in connection with our discussion of each of the reservoirs, upon which we are unahle now, to set a value. It is manifest that a reduction in the capacity of the reservoirs would begin as soon as the dams should he completed, because they would rapidly fill up with mud; and that the cost chargeable against each million cubic feet of water would, therefore, constantly increase. The property flooded by the Croton reservoir had a much higher market value than much of that which Mr. Leighton proposes to flood; not hecause it held more, or even anything like as much intrinsic wealth, hut simply because it had been more highly developed on account of its closeness to existing markets and its superior railroad transportation facilities. The diminution of the future wealth of the Nation resulting from destroying an acre of coal or gas and oil territory, underlying rich alluvial bottom lands, would be much greater than that resulting from destroying an equal area of average agricultural land that had been highly improved.

According to Mr. Leighton's figures, his 100 reservoirs, when first put into service, would have a capacity for 2,148,749 million cuhic feet. If, to this quantity, we apply the unit cost derived from our partial estimate ($1,372.71), we have a total cost of $2,949,609,239.79. If we apply a unit cost of $1,800 per million cubic feet (the actual cost for the Croton reservoir), we get a total of $3,867,748,200. Interest on this sum at three per cent (Mr. Leighton's assumption) would be $116,032,446 per annum.

To earn this sum at fifty cents per horse-power, per annum (the rental now actually paid at dams in the Muskingum River, in Ohio), would require 232,064,892 horse-power, whilst Mr. Leighton seems only to hope that, by some unexplained legerdemain, his reservoirs might

be the means of producing a potential energy equal to about 25,000,000 horse-power. The balance of us can discover only the possibility of their producing about 2,560,000 horse-power, even if severed from the absurd navigation and conservation features of his marvelous Utopian project. The aggregate contents of the proposed reservoirs, if all were full every year, would (before the mud conservation feature came into play) be only 2,148,749 million cubic feet, and that amount of water falling **four hundred feet** could produce only about 3,200,000 horsepower, per annum. Taken at eighty per cent efficiency, this would give only 2,560,000 horse-power. When we consider that it would, in practice, probably be impossible to utilize more than sixty to seventy-five per cent of the four hundred-foot fall, and when we further consider that the reservoirs would probably be filled only about once in five years, we get another glimpse of the beautifully imaginative and "will-o'-the-wisp" character of the estimates now being foisted upon the public by the "conservation cranks," and "waterways boomers."

That the proposed reservoirs could not, under the "regulation," "conservation," "navigation," "reclamation," "clarification" "regimentation," "purification," and "co-ordination," and conditions that Mr. Leighton and Mr. Roosevelt impose, produce any power at all, having a commercial value, has already been sufficiently demonstrated.

The scheme, though amusing, grows wearisome in its superabundance of absurdities and we will not stop to consider what might be the effect of evaporation and absorption in reducing the volume of the impounded water, if held, during June, July and August, in the warm climate of Virginia, Tennessee and Kentucky, and then discharged along the hot (perhaps, dusty) channels and thirsty banks of the Ohio River and its tributaries, during the months of September, October and November.

In passing, it may be interesting to note that the effect of 20,000 million cubic feet of discharge, from artificial lakes at the head of the Volga River, though about 1,200 miles farther from the torrid zone than most of Mr. Leighton's reservoir sites, wholly disappears within 400 miles of the lakes, and that the effects of the flow of 93,000 million cubic feet, from the artificial lakes at the head of the Mississippi River, though about 500 miles farther north than most of Mr. Leighton's reservoir sites, wholly disappears at Lake Pepin, 387 miles below the reservoirs. What effect would the discharge from reservoirs in the "Sunny South" at the head of the Tennessee River, about 650 miles

above its mouth, have on the waters of the Ohio and Mississippi Rivers? We do not know. Can Mr. Leighton tell us?

The Special Board of Engineers appointed under Act of Congress to inquire and report as to the feasibility of obtaining and maintaining a fourteen-foot navigable channel in the Mississippi River, between St. Louis and New Orleans, has recently made a report in which it is stated that among the seven methods proposed by various enthusiasts—all of them inexpedient—the only one that is wholly impossible is the **Reservoir Scheme.**

In discussing the effects obtained from the artificial lakes that have been formed at the head of the Mississippi, the report says:

"This system of artificial reservoirs is one of the largest in the world so far constructed for regulating river discharge for navigation purposes, and yet the increase in height thereby obtained at St. Paul during the low water period, about ninety days, averages only fourteen inches; the results so far noted ranging from forty inches maximum increase in height in 1900 to five inches minimum increase in 1903. The river at St. Paul has a low water width of only 400 feet and an average low water discharge during the season of navigation of but 2,500 cubic feet per second.

"The effect of the reservoir system diminishes as the river becomes wide, and finally disappears at the head of Lake Pepin, fifty-one miles below St. Paul.

"In order to obtain the effects above named as reported at St. Paul, it has been found necessary to commence the discharge of water from the reservoirs considerably in advance of the low water stage at St. Paul, owing to the length of time that is necessary for the water to traverse the intervening river. After the discharge has been commenced at Lake Winnibigoshish, its effect is not specially felt at Lake Pokegama, the distributing reservoir, sixty-three miles further down stream, until after an interval of twenty-one days at low water, nor at St. Paul, 351 miles below Lake Pokegama, until after a further interval of ten days. In order to use this reservoir system for the benefit of the improvement of the river below St. Louis, it would be necessary to commence the discharge at the reservoirs at least two months before it was needed at St. Louis."

When Mr. Leighton becomes sufficiently "scientific" to forecast, with certainty, the weather, the rainfall, and the stage of water at Paducah, sixty days in advance of actual events, it may be worth his while to attempt to overcome the other difficulties that now make his "Reservoir Scheme" ridiculous and impossible.

Those "scientists" who believe in the transmigration and reincarnation of souls may entertain some hope that he will yet present a practical solution, but the balance of us, who believe that "man born of woman, is of few days and full of trouble," should try to realize and accept with resignation the sad certainty that Old Charon will have given all our "Conservation Cranks" and "Waterways Enthusiasts" a practical lesson in primitive oar-boat navigation, long before the Laws of Nature shall have been effectively modified by means of popular clamor, "Formal Resolutions," "Executive Messages," "Waterways Conventions" with brass band accompaniments and infinite other forms of folly, fuss and feathers, circulated by means of pamphlets, posters, magazines and newspapers.

The only practical and experienced engineer, whom the President appointed as a member of the Inland Waterways Commission, General Alexander MacKenzie, Chief of Engineers, U. S. A., did not sign the "Preliminary Report," which the President declared to be "thorough, conservative, sane and just." He wrote a supplementary report, opposing the appointment of a permanent Inland Waterways Commission as unnecessary, and closing with the words, "I have great fear that the scheme of operations recommended in connection with the proposed permanent commission would be found to be impracticable." General MacKenzie is an engineer of forty-six years' experience, devoted chiefly to improvement of navigable waterways. He served with distinction in the United States Army during the Civil War, and is regarded as one of the ablest of the men who have filled the position of Chief Engineers of the Army, though many strong men have held the office.

Pictures of some of the dam sites selected by Mr. Leighton, and of some of the sites at which dams are being erected in our Western desert, are shown herein. The contrast is very striking.

Chapter VI.

EXISTING AND PROSPECTIVE CONDITIONS.

"The action of the United States Government and of the State legislatures, combined with personal damage—claim lawyers and labor unions, in conspiring to take the control of the property of the railroads from their owners—bind them hand and foot, that they may be the more readily plucked—has caused, and will, I fear, continue to cause investors to refrain from loaning the capital required to make the necessary additions."—(Milton H. Smith, President of Louisville & Nashville Railroad Company, in letter to Railroad Commission of Tennessee, nine months before the panic of 1907.)

We have considered briefly the importance of transportation in facilitating world-progress and we have adverted to the wonderful rate of progress and development, in the United States, that resulted from the adoption, by the government, of a wise policy of non-interference with trade and with the circulation and transportation of the National wealth. We have given much space to a discussion of a preposterous scheme for waterway improvement, in the interests of commerce, which were wholly unworthy of serious notice, but for the fact that Mr. Roosevelt, when President of the Nation, probably misled by his violent prejudice against the railroads, and by advice and information obtained from youthful and impracticable visionaries, seems to have given it approbation and urged Congress to provide "adequate funds," for putting it into effect, "by bond issue if necessary," saying: "It is neither necessary nor advisable to postpone the beginning of the work until all the facts are known."

We will now consider some matters worthy of serious study.

Previous to the month of October, 1907, the United States had experienced several years of remarkable business prosperity and commercial expansion, and the transportation facilities of the country had been taxed severely.

A large portion of the then existing railroad mileage, particularly in the West and in the South, had been constructed in advance of the era of prosperity. Most of it had been pushed through lonely forest

and desert territory in advance of population, without much knowledge of the hidden mineral resources of the country traversed, and long before there was any reason to anticipate the astounding rate of development that would result from the construction of the lines. Under the conditions that had existed, whilst these lines were being built, it had been found difficult to secure capital for their construction, because men, with money to loan, had been chary of investing in the securities of experimental railroads, being built so far from civilization and from the centers of population. Consequently, the builders of such lines had been compelled to economize in every possible way—use steep grades to climb up the hills and mountains and to descend into the valleys, because they could not secure funds to spend on costly tunnels, bridges and viaducts, by means of which the steep places might have been eliminated. The engineers were compelled to us much sharp curvature to avoid deep cuts and high embankments. The managers could supply only light rails, small locomotives, etc., because "the tailor must cut his coat according to his cloth."

In building many such railroad lines—now become great thoroughfares of traffic—grades as steep as one and one-half to two or even three per cent (79 to 158 feet per mile) had been used with much sharp curvature. Only slow trains of light tonnage can be hauled over such railroads, hence the traffic capacity of these roads was very limited. With these lines built, however, giving access to vast inland areas, multitudes of people, seeking freedom from intolerable conditions in Europe, where eternal government "interference" with and "regulation" of Commerce made progress difficult or impossible, rushed into the territory.

Here they were freemen. There were no onerous legislative restrictions upon their labor or upon the disposition that they might wish to make of the wealth that they could produce by their labor. Their ambition was quickened, their energy and enterprise stimulated. They made clearings in the forests; they sought for and discovered vast mineral deposits—gold, silver, copper, lead, coal, etc.—they irrigated deserts, utilized the energy of waterfalls, builded cities. Great multitudes of immigrants thronged into the country and soon the capacity of the very railroads that had caused all this unprecedented progress and prosperity began to be taxed. No one had foreseen the conditions that arose and developed so rapidly after the re-

covery from the panic of 1892, and the transportation agencies were taken unawares.

In some localities—notably the vast grain-producing plateaus of the Northwest—much embarrassment and considerable loss resulted. At that time the bitterness and hatred towards the railroads, that had been engendered, nursed and stimulated by the demagogues, had reached its climax. For many months previous to this culmination, the managers and owners of railroad properties had been struggling to increase their mileage and improve their lines in order to meet the conditions that had arisen. They had found it well-nigh impossible to secure funds for such purposes, because the denunciations hurled at them by the President of the Nation, and by the ignorant and venal demagogues, who had gained control of the executive and legislative branches of government in some of the states, had destroyed their credit and the value of their securities. The railroads were transporting vast quantities of material with which to improve their own facilities. Their need for immense quantities of cross-ties, steel rails, steel bridges, etc., for new tracks, for the improvement of old lines, and for additional equipment, greatly stimulated all lines of industry. Multitudes of men were paid extravagant wages. This enabled them to buy freely and consequently business and transportation were further increased. It is impossible to state, with any degree of certainty, just what portion of the traffic and transportation of the time was directly due to the tremendous amount of railroad building and improvement that was in progress, but it seems probable that more than one-fourth of all the freight being hauled throughout the United States, during the ten years preceding the panic of October, 1907, was being moved as a result of the efforts of the railroads to prepare to handle a larger tonnage for the citizens.

Mr. Milton H. Smith, President of the Louisville & Nashville Railroad Company, said, in a letter addressed to the chairman of the Railroad Commission of Tennessee, written on January 31, 1907, more than nine months before the panic:

"I venture the opinion that the existing facilities of the railroads will, in a comparatively short time, twelve or eighteen months, be adequate to the transportation requirements. This is based upon the fact that a large proportion of the existing traffic is the result of the enormous expenditures that have, for a number of years past, been made by the railroads of the country in adding to their facilities, the expenditures made and those authorized and under way amounting to

many hundreds of millions of dollars, and such expenditures, in addition to giving employment to many millions of people, have created directly and indirectly, a very large traffic which the railroads have been moving. If railroad companies cannot obtain additional capital, it follows that as soon as the capital already provided has been expended—the improvements, additions, etc., now under way completed—the employment and traffic that have resulted from construction expenditures by the railroad companies will cease."

The conditions were at that time wholly unnatural and overstrained, but temporary. If broad-minded statesmen had been at the helm of National affairs during the period of stress, no serious or lasting evils need have resulted. If the railroads had been enabled to secure funds for improvement, they would have been ready to keep pace with the development of business, after a brief period of embarrassment resulting from the fact that none of the managers had foreseen the full extent of the tremendous increase in traffic. Some of the railroads could not successfully handle their own immense temporary construction tonnage and, at the same time, promptly supply all their patrons with facilities when demanded. Though the difficulties were temporarily acute and the distress real, the agitators and demagogues magnified them many-fold, in printed reports and in political speeches. The President of the Nation, returning from a pleasure trip which he had been enjoying, whilst the railroad managers were struggling desperately to meet and overcome the difficulties of the situation, stopped in Nashville, Tenn., October 22, 1907, long enough to deliver a public oration, in which he used many violent expressions, which, in the heated state of popular sentiment, were justly interpreted as an attack upon vested interests and an appeal to the popular prejudices against the owners of railroad securities. He said, among other things:

"I want to see the process, the process of gaining wealth by successful dishonesty, stopped before it goes so far as to invite the very reaction of which I speak. And the man of property, the man of great means, will do well to turn and, in the loftiest way, back up a rational movement for reform, a rational movement for such supervision and control over the use, over the accumulation and business use of these great fortunes, as will, if not eliminated, at least minimize the evil of which I complain."

The Knickerbocker Trust Company closed its doors in New York City, on the same day, and the people of the Nation were suddenly

face to face with a financial panic—the legitimate fruits of the folly and fury into which they had been led by the insensate demagogues.

Justice is the Supreme law of the Universe, and the man or Nation that sins against that supreme law must, sooner or later, suffer the bitter consequences. This the American people have since realized. Many of our citizens suffered great loss. Many fortunes were wrecked. Banks went down in ruin. About a million working men were thrown out of employment. Many millions of innocent women and children suffered from the resulting want and privation. The railroad managers were forced to stop building new lines and improving old ones. Within six months there were 413,605 idle freight cars standing on rusting side tracks throughout the United States. Mines, mills and manufacturing plants were closed. Hundreds of thousands of laborers emigrated from the country, and the agitators and muck-rakers, who had precipitated the panic, were, with renewed zeal, setting before the distressed people of the Nation, ludicrous schemes for building a multitude of impracticable or impossible waterways. Apparently, on the theory once held by the doctors, that, when a man is dangerously sick, the best thing to do for him is to cover him with blood-sucking leaches.

In spite of the disastrous effects of past mistakes the population of the country continues to grow rapidly, and all thinking men familiar with National conditions realize that the cessation or reduction of industry and commerce, from which we have suffered, during the past two years, can be only temporary.

With the close of Mr. Roosevelt's administration, the demagogues have, in large measure, lost their power for evil. Mills, mines and factories are again being put in service, and must be increased in capacity in order to supply the necessities of the increasing millions of our population. In order to successfully handle the products of the labor of these multitudes, the system of transportation must be greatly improved and extended. That work should now be under way, indeed, would never have been stopped, had the agitators not produced conditions which made it impossible for the managers and owners of the railroads to secure funds for the execution of their wise and far-reaching plans for improving and extending their lines.

During the past two years this Nation has built no railroads, but has stood paralyzed, stupidly listening to the senseless vaporings of impractical theorists and irresponsible agitators, who shout the praises of a multitude of ridiculous schemes for building canals and

deepening rivers, in the face of the acknowledged fact that we now have more and better inland waterways than any other Nation on earth, and find that we can make practically no use of them for commerce, because that kind of transportation is as truly out of date, in progressive America, as are the pack horses, stage coaches and palanquins of our ancestors.

The men now at the helm of the National government doubtless understand the situation. They seem to be doing what they can to restore normal conditions and counteract the effects of the folly of their predecessors. It is yet too early in the life of the new administration for us to feel certain that Prudence, Justice and Wisdom are to succeed the recent reign of folly, demagogy and so-called "practical politics." Our Great Empire Builders appear to be waiting for assurance that they may again safely go on with their work.

Our statesmen could render no greater material service to their country than by encouraging the Builders to proceed with the execution of their plans for extending, improving and perfecting avenues of traffic and transportation; and this can be done only by giving assurance that capital invested in such enterprises will be under the control of the owners and managers of the properties, and not liable to confiscation, or subject to ruinous "regulation" by commissions of politicians who, knowing nothing of the science of transportation, and ever seeking to please the proletariat, are of ncessity, incapacitated for the work which they should try to perform. During the past few years the whole trend of government policy, both National and State, has seemed to be specially designed to discourage the very work that we most need. During the last years of the Roosevelt administration, we heard of little else than efforts on the part of the Nation's legislatures, composed of farmers, lawyers and professional politicians, wholly inexperienced in the abtruse modern sciences of transportation, to interfere with and to "Regulate" the portions of great railway systems lying within the borders of the several states. Finding that this pleased the more ignorant portions of the populace, the zeal of the "Regulators" knew no bounds. Railroad commissions were appointed in all the states, seemingly for the sole purpose of harassing and bedeviling the managers and operators of the railroads. Hundreds, and perhaps thousands, of foolish and irrational anti-railroad laws were introduced in the various State legislatures, by the farmers, lawyers and politicians, proposing without "rhyme or reason" to reduce passenger and freight tariffs, to "Regulate" the numbers of cross-ties,

the kinds of headlights, the hours of service of employees, the conditions of sinks and water closets, etc., etc. Laws were proposed and enacted to compel the railroads to carry excess baggage free; to compel them to put up protecting fences and railings at certain passenger stations, and to compel them to pull down similar arrangements at certain other stations.

Many of the laws proposed and enacted during the period of excitement are so absurd that they will probably seem as incredible, to our descendants, as do the laws, once enforced in New England and in Scotland, now seems to us. The ancient Scottish law forbidding a man's kissing his wife on "the Sabbath" is very much of a piece with much of the anti-railroad legislation recently enacted in the states of Alabama, Georgia, Texas, Wisconsin and elsewhere. The feeling engendered, amongst the masses of the people, towards the managers and owners of railroads, was not wholly dissimilar from that once entertained by the godly Puritan divines and their followers, towards the terrible witches who infested their parishes, and with whom Tam O'Shanter and his gray mare, Maggie, had such a thrilling experience.

It is at least clear that, as a result of the tremendous contest between the agitators and the bogies of their heated imaginations, the transportation systems were left high and dry on the "Keystone of the brig," holding only the gray tail of the prosperity that they had themselves made possible.

The Congressmen and members of State legislatures who insisted upon enacting laws to regulate railroad traffic and operations, and upon appointment of "Commissions" to harass and bedevil the railroad managers, constantly justified their folly by pointing to the fact that similar laws are in effect in Europe—forgetting that they could produce no stronger presumptive evidence of the unwisdom of such laws than the mere fact that they are enforced in Europe—in countries from which the poor and destitute have been escaping by millions, in order to find a home with us, previous to the time (October, 1907) when the current of immigration was turned back upon its source, by the disastrous effects of just such laws.

Shall we, some day, have legislators advocating the erection of a wall around America, because there exists such a monument to ancient barbarism, between Thibet and China?

The European precedent to which our legislators appealed, is the chief cause of the slow commercial progress of many of those Nations. Says Buckle (in the "History of Civilization," which we have

already quoted), in condemning the folly of European legislation to interfere with and regulate trade: "Indeed, the extent to which the governing classes have interfered, and the mischief which that interference has produced, are so remarkable as to make thoughtful men wonder how civilization could advance in the face of such repeated obstacles. In some of the European countries, the obstacles have, in fact, proven insurmountable, and the National progress is thereby stopped. * * * To sum up these evils would be to write a history of English legislation; for it may be broadly stated, that, with the exception of certain necessary enactments respecting the preservation of order and punishment of crime, nearly everything that has been done has been done amiss."

And yet, contrary to the accumulated wisdom and experience of the whole human family, we Americans, boasting of our progressiveness, have, in the beginning of the Twentieth Century, tried to go backwards, by enacting innumerable laws designed to interfere with trade and transportation and to regulate the flow of the life blood of the Nation, along the veins and arteries that have been developed in conformity with natural law, reason and common sense.

When the American people wake up to a realization of the effects of all this injustice, persecution and demagogy, they will overwhelm with curses the men responsible for it. Curses, however, cannot relieve suffering from the inevitable results of the folly and rascality that the public has permitted and even condoned.

What can be done? Even the demagogues seem dimly to realize the necessity for preparing to handle the vast traffic of the future. It is impossible to secure funds for building or improving railroads so long as the control of such properties remains in the hands of irresponsible political railroad commissions, composed of men whose sole desire seems to be to wreck the properties in order to gain the applause of the masses, whom they have duped. The brainy men of the country, who have won great fortunes, will certainly be slow to invest in the securities of properties which they are not permitted to manage; which may be confiscated the next time the People are bewitched by some astute and unscrupulous demagogue; which are even now being greatly injured because of innumerable unjust and unconstitutional legislative enactments, and because of constant interference from ignorant and incapable railroad commissions. Without such investment, no further building is possible.

What shall we do? The agitators and demagogues, who are responsible for the existing paralysis, answer: Build canals and canalize the rivers. Let the government issue bonds to secure thousands of millions of dollars with which to canalize the rivers, build ship canals, large enough to pass war vessels, from the Gulf to the Lakes, from Albany to Buffalo, from Boston to Jacksonville, from Jacksonville to Galveston, etc., and many honest people are vociferously applauding.

Do the people realize what has been the cost of building deep ship canals in the few places on earth where they have been found at all practicable? It is as follows:

Name of Canal and Location.	Length in Miles.	Cost.
The Manchester Ship Canal, England	35.5	$ 75,000,000.00
The Welland Canal, Canada	26.75	27,275,869.40
The Chicago Drainage Canal, United States (not finished)	30.	55,000,000.09
The Corinth Canal, Greece	4.	5,000,000.00
The Kaiser Wilhelm Canal, Germany	61.	40,000,000.00
The Suez Canal, Africa	90.	100,000,000.00
The Sault Ste. Marie Canal, Canada...........	1.25	4,639,180.62
The St. Mary's Falls Canal, United States......	1.6	6,033,533.00
The Panama Canal, Central America (estimated cost)	49.	400,000,000.00
	299.10	$712,948,583.02

This gives an average cost of $2,383,646.21 per mile.

If we omit the Panama Canal, which may, and probably will, cost far more than $400,000,000.00, but where the difficulties to be overcome are phenomenal, we have 250 miles at an average cost of $1,251,794.33, though we include the Suez Canal, about two-thirds of which extends through shallow lakes, with eight miles that required no excavation; for which no purchase of right-of-way was required, and where there was an illimitable supply of "the cheapest labor in the world;" though we include the Kaiser Wilhelm Canal that was dredged through swamps and lakes and along river courses, and which is only seventy-two feet wide in the bottom (an enlargement being estimated to cost $1,000,000 per mile); and though we include the Welland Canal, which is a failure because it is only fourteen feet deep and cannot pass the vessels now handling the traffic on the Great Lakes.

The figures above given do not include the cost of operation, maintenance and renewals, which, in the case of the Suez Canal, is $1,300,000 per annum, though that canal has no locks or dams, and in the case of the Welland Canal has aggregated $1,585,406.20 in the past seven years, though it is only twenty-five and three-quarter miles long and carries but little traffic.

Do the people know the results of the construction of these tremendously costly waterways? That the Welland Canal is a failure? That the Manchester Canal has never paid interest on the money invested in it? That the Chicago Drainage Canal carries no traffic, and is only an extravagantly costly sewer? That the Corinth Canal is a total failure, and is now advertised for sale to the highest bidder? That every canal in the United States, except the one at St. Mary's Falls, which is only one and six-tenths (1.6) miles long, is a total failure? That most of the canals that have been built in the United States have been abandoned? That freight movement on canals and canalized rivers is far more costly than rail freight movement, whilst at the same time much slower, because confined to long, crooked, circuitous routes and subject to many more contingencies and much greater dangers?

The railroads, as corporations, are totally indifferent to the construction of canals, because their managers know that, unless the canals are made large enough to pass sea-going vessels, they can never successfully compete with the rail lines, but many individual railroad men, as patriotic citizens and as taxpayers, will join with other citizens in vigorously protesting against the folly and extravagance of a stupendous government bond issue to secure funds to be stolen by politicians or wasted in furthering the impracticable schemes of crochet-mongers, idle visionaries, long-haired doctrinaires, or of the dishonest demagogues who plan to loot the National treasury as they recently planned to confiscate the property of the railroads.

Chapter VII.

AMERICAN CANALS OF LESS THAN TWENTY FEET DEPTH.

"The programs submitted for National waterway improvement cater to the greed of every section and almost every State, by presenting a cob-web of nine-foot, six-foot and even four-foot channels, whose construction is supposed to go forward simultaneously and most of which would be valueless to commerce if they were finished and presented to the public free of cost."—Jas. J. Hill, Chairman of the Board, Great Northern Railway.

There are in the United States shallow canals (four to eleven feet in depth) aggregating about 2,680 miles in length. All of them have proven unprofitable as investments of capital. It is found that it is more costly to move freight by way of the canals, even when they are maintained by the government, without toll charges, than on railroads. A large part of this canal mileage has been abandoned, and the portions not actually abandoned are practically worthless. The St. Mary's Falls Canal, twenty-one feet deep and one and six-tenths miles long, is the only one in the United States that has any considerable value as a commercial highway, and its value is due to the fact that it connects two great inland seas. The total failure of all the shallow canals in the United States is conceded by all well-informed persons. The aggregate cost of their construction was about $230,000,000.00, but their abandonment has been accepted as a necessary result of modern development. No reasonable man regrets the passing of the canal boat any more than he does the passing of the stage coach, or the tallow-dip candle, however much he may lament the immense sums of money that were wasted on them.

A study of the cost of building and operating some of the American canals should be interesting in view of the wild statements that have been circulating through the magazines and newspapers, during the development of the "Inland Waterways Craze."

Muscle Shoals Canal, Tennessee River, Alabama.

(See Reports of Chief of Engineers, U. S. A.)

The Tennessee River is 652 miles long. The government projects for its improvement, as shown by the admirable reports of the army

engineers, are considered in three sections, first from the junction of Holston and French Broad Rivers, a few miles above Knoxville, Tennessee, to Chattanooga, Tennessee, 188 miles; second, Chattanooga to Riverton, Alabama, 238 miles; third, from Riverton to Paducah, Kentucky, which is on the Ohio River, at the mouth of the Tennessee, 226 miles. The largest expenditures, past and prospective, for improvement of navigation, are within the second sections, between Chattanooga, Tennessee, and Riverton, Alabama. Within this reach there are two rapids (the "Muscle Shoals" and the "Colbert Shoals") which during low water periods, impede the passage of the little packet boats that ply on the river. The Tennessee River flows through a territory in which there are no cities, except at points where railroads cross the river. The country near the river is a fine timber and agricultural region which has, as yet, for the most part remained undeveloped. There are no railroads paralleling the river closely, except for short distances, hence the farmers and timber dealers of the territory must haul their products and supplies many miles across a hilly region, over rough, dirt roads, or else float them on the river. Such conditions have led to the growth of a considerable commerce on this river—chiefly in logs and lumber floated on the river when there is a good stage of water in the channel, and when the shoals present no obstacles. The total commerce of the river below Chattanooga during the year of 1907 was as follows:

In the reach between Chattanooga and Florence, 413,751 tons, of which 216,496 were lumber, logs, etc. In the reach between Florence and Paducah, 766,118 tons, of which 673,941 tons were lumber, logs, etc. It is seen, therefore, that about seventy-five per cent of all commerce of this 464 miles of the Tennessee River, as stated in the reports for 1907, was of a character that is usually floated loose, or in rafts, requiring only two or three feet of water. Such commerce is temporary and must soon be exhausted.

The Muscle Shoals Canal is eighteen miles long and five feet deep. It was completed in the year 1890 for the ostensible purpose (the real purpose can best be understood by persons familiar with the methods and motives that govern the administration of the National political "pork barrel") of providing a means for passing boats around the Muscle Shoals, in the Tennessee River. These shoals are a few miles above Florence, Alabama. The canal cost $3,191,726.50; has been in service eighteen years, and the total cost of operation, maintenance and renewals, during the seventeen years, ending June 30, 1908, had

been $1,075,056.54 or an average of $63,238.62 per annum. During the seventeen years, 210,443 tons of freight have passed through the canal, or an average of 12,379 tons per annum.

The interest on the investment, at 4 per cent per annum, is	$127,669.06
The average annual cost of operation, maintenance, etc., has been	63,238.62
Total cost per annum	$190,907.68
Packet boat charges on 12,379 tons, at 27 cents	3,342.33
Total cost per annum for average of 12,379 tons, 18 miles	$194,250.01

MUSCLE SHOALS CANAL, TENNESSEE RIVER (LOOKING DOWN RIVER BELOW LOCK NO. 7).

x Mud, dried and cracked, which will have to be taken out with dredge to maintain necessary depth of water.

September 29, 1908.

The twenty-seven cents for eighteen miles of packet boat transportation is figured at one and one-half cents per ton-mile, which is about the rate charged by such boats, where rates are not "regulated" by railroad competition.

It is seen, therefore, that it has cost the Nation and the shippers $15.69 per ton, to move freight eighteen miles through this canal—a

cost of eighty-seven cents per ton-mile. The average railroad rate on all classes of commodities in the United States during the years 1906-07 as stated in the report of the Interstate Commerce Commission, was 0.759 cents per ton-mile. We see, therefore, that the cost of moving freight through the Muscle Shoals Canal, during the past seventeen years, has been 110 times as great as the average railroad rate on all commodities within the United States, in recent years. This is three or four times as costly as moving freight by ordinary wagons and probably approximates the cost by means of pack mules.

Let us consider what might have been accomplished with the same money.

The original investment was	$3,191,726.50
If the money had been invested in four per cent railroad bonds, during the seventeen years that it has been idle, and the interest re-invested semi-annually, the accumulation would have been	3,067,740.80
Actual cost of operation, maintenance and renewals for seventeen years	1,075,066.49
Total cost and waste	$7,334,533.79

Besides this, there has been paid freight on 210,443 tons at about twenty-seven cents, equals $56,819.61 for only eighteen miles transportation.

The distance by river from Chattanooga via the Muscle Shoals Canal and Florence to Paducah, on the Ohio River, is 464 miles. A railroad located along the river could reduce this distance about fifteen per cent by following the foot of the hills and cutting off the bends, so that such a road would probably be about 395 miles long. It could be built along the edge of the river bottoms, almost on the surface of the ground, nearly the entire distance, and would be nearly level. So eager are the local people to be relieved from the intolerable inconveniences of packet-boat transportation, that nearly all the necessary lands for a right-of-way would probably be donated. If the line were built with sixty-pound rails and ballasted with earth, sand or gravel (as is ordinarily done in first construction in the South), the cost should not exceed $17,000 per mile. This would make the total cost $6,715,000—less by $619,533.79 than the amount that has already been wasted on the eighteen mile canal. The $619,533.79 (at $0.0076 per ton-mile, the average railroad freight rate in the United States) would pay the freight charges on the whole of the 210,443 tons that passed

through the eighteen miles of canal, for a distance of two hundred miles, and leave a balance of $299,660.43. The traffic on this part of the river is practically all short-haul local freight

MUSCLE SHOALS CANAL, TENNESSEE RIVER.
Portion of Aqueduct over Shoal Creek looking down Shoal Creek.
September 29, 1908.

(see statement in report of Chief of Engineers), and it is doubtful if the average movement is as much as fifty miles. The $56,819.61 paid by individuals for boat fares through the canal (not to

MUSCLE SHOALS, TENNESSEE RIVER.
September 29, 1908.

speak of the great cost for packet fares over the balance of the 200 miles) could have been returned to the "dear people" about whose welfare the waterways agitators are so solicitous. Such a rail line, without debt, could be leased or sold to one of the existing railway systems, which would supply the necessary terminals and equipment, and pay a large yearly rental, or a big purchase price. Taxes on such a railroad would have added great sums to State revenues, whereas the canal pays no taxes. The State and municipal taxes now being paid by the railroads in the United States are said to aggregate $75,000,000 per annum. The benefits to the country along the 395 miles of railroad

AQUEDUCT OVER SHOAL CREEK, MUSCLE SHOALS CANAL, TENNESSEE RIVER.

The Steamer "White Oak" and a barge are using the aqueduct for a dry-dock, because at this time, and for many months of each year, there is not enough water, above or below the canal, for the purpose of navigation.

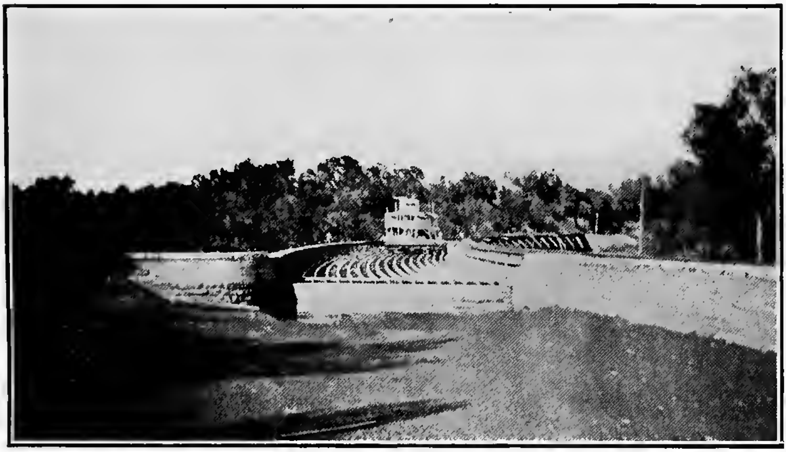
September 29, 1908.

resulting from building such a railroad could be estimated only in millions.

Are the men who loot the National treasury in order to build worthless canals, friends of the people? What could the government now get for the Muscle Shoals Canal, if it were sold at auction, with the requirement that the purchaser operate it? A rational man would not accept it as a present, under such conditions.

That a railroad will be built along the river, before many more years have passed, is certain. Whenever that happens the canal must be abandoned. Similar waterways have been abandoned, as soon as competing rail lines were built, in New York, Pennsylvania, Virginia, Maryland, Ohio and several other states.

The statements made above do not fully show up the ludicrous nature of the "improvements" in the Tennessee River, between Chattanooga and Riverton, now in progress, in which millions of dollars of public funds are being wasted. The total amount of freight passing



AQUEDUCT OVER SHOAL CREEK (LOOKING EAST), M. S. CANAL, TENNESSEE RIVER.

Steamer White Oak is using aqueduct for a dry-dock, since at this time and for many months in the year, there is not enough water above or below the canal for purpose of navigation.

September 29, 1908.

through the Muscle Shoals Canal, in the years 1904 to 1907, inclusive, was 76,334 tons, of which 47,307 tons, or sixty-two per cent, was logs, lumber, staves and railroad ties. These commodities are low-class freight on which the railroad rates, for long shipments, are usually about one-half of a cent or less, per ton, per mile, whilst the average cost by canal has been eighty-seven cents. The actual published railroad rate on common lumber, car load lots, between Pensacola, Florida, and St. Louis, Missouri, 790 miles, is $4.20 per ton, whilst the actual cost of transporting every ton of the same class of freight that has passed eighteen miles through the Muscle Shoals Canal, during the

past seventeen years, has been $15.69 per ton. At railroad rates, the same money would have paid for shipping that same freight 2,950 miles, or about the distance from New York to San Francisco. Moreover, we find that the existence of the canal, which cost $3,191,726.50, has probably been of no great benefit to this particular class of commodities, comprising sixty-two per cent of all traffic on the canal, since the reports of the Chief of Engineers shows that during the same four years the tonnage of similar commodities (lumber, logs, cross-ties, etc.) on the open river, between Chattanooga and Florence, aggregated 526,-

INTERIOR OF LOCK NO. 7, MUSCLE SHOALS CANAL, TENNESSEE RIVER.

x West end of Aqueduct over Shoal Creek.
No water in canal when picture was taken.
September 4, 1908.

047 tons—more than eleven times as much as passed through the canal, which is also between Chattanooga and Florence. Logs, lumber, cross-ties, etc., are cheaply transported on most of our rivers, in rafts that draw only six to eighteen inches of water, and there has been much bitter complaint on the part of lumber men in the mountains of Kentucky and elsewhere, because the government has built locks and dams in some of the rivers, and such "improvements" obstruct the channel and make it more difficult and costly for them to get their rafts and logs to market.

In spite of all this evidence that the canal at Muscle Shoals is a monstrous absurdity, the government is even now building another

canal, eignt miles long, to pass boats around the "Colbert Shoals" a few miles below the Muscle Shoals. Previous to June 30, 1908, there had been expended on the "Colbert Shoals Canal" $1,711,855.96, and it was then estimated that it would cost $759,000.00 to complete it!!

Probably no other Nation in the civilized world has ever been guilty of such egregious folly. The Pyramids of Egypt are, at least, magnificent monuments and doubtless served the purpose of gratifying the vanity of the builders; but an abandoned canal, built solely for the

LOCK NO. 6. MUSCLE SHOALS CANAL, TENNESSEE RIVER.

There was no water in the canal when picture was taken, September 4, 1908. Boats are towed through this canal by a locomotive running on railroad tracks on right.

purpose of distributing the disgraceful "pork-barrel" political fund, is a disease-breeding eye-sore; a monument to the folly of a Nation and the dishonesty of her politicians.

Yet ex-President Roosevelt, and his innumerable admirers and imitators, advocate the issuance, by the National Government, of hundreds of millions of dollars of bonds, in order to secure funds with which to build similar or even more preposterous inland waterways; and Mr. Roosevelt, as President of the Nation, said: "It is neither necessary nor desirable to postpone the beginning of the work until all the facts are known."

Des Moines Rapids Canal, Mississippi River.

(See Report of Chief of Engineers for 1908, page 1,642.)

Before the era of railroads, in the Mississippi Valley, there were hundreds of steamboats plying on the great river that has long been known as the "Father of Waters." Many of these boats were immense structures, and were commonly spoken of as "floating palaces." They bore a very large tonnage of commerce and contributed much to the up-building of the valley.

KEOKUK, IOWA.

Once the head of low water navigation on the Mississippi. View showing house and shanty boats along the shore near Des Moines Rapid Canal.

Just above Keokuk, Iowa, there is a shoal or rapid seven miles long, over which large steamers cannot pass during periods of low water, and consequently, Keokuk was, for a long time, the head of navigation, for large boats, during such seasons. In order to overcome this obstacle, the National Government built the "Des Moines Rapids Canal" and the conditions existing at the time of its construction—shortly after the Civil War—doubtless seemed to justify the expenditure, inasmuch as men are not seers and cannot foretell future events. The original estimate of cost was $2,631,576.00, but, as so frequently happens, the actual cost went far beyond the estimate and reached $4,574,900.00.

For many years a large traffic was moved through the canal, but gradually, as the country developed, conditions in the magnificent val-

ley changed. The march of progress was rapid. The slow moving steamboats could not meet the demands of modern civilization. Railroads were built along the river on both sides. They could haul passengers and freight far more rapidly, economically and safely than could the boats, and so the traffic through the canal rapidly declined, although the freight traffic of the valley was constantly increasing at an astounding rate. As late as the year 1900, the freight passing through the canal amounted to 226,646 tons. Even then, however, there was little besides forest products floated down the Mississippi. Of the total commerce just mentioned, 201,333 tons were in logs, lumber, laths and shingles. The forests were rapidly exhausted and even that traffic constantly diminished.

A consideration of present conditions at this canal is interesting, in view of the ludicrous claims being made by the advocates of government bond-issues for the building of "Inland Waterways." The canal is five feet deep, 7.6 miles long, and about 300 feet wide at the surface of the water. The average cost of its maintenance and operation, during the past thirty years, has been $43,467.27 per annum. The average annual gross

DES MOINES RAPIDS CANAL, KEOKUK, IOWA., 7 1-2 MILES LONG.

Freight borne by canal costs 160 times as much as freight borne by rail along the branch parallel with the waterway.

tonnage of freight passing through the canal during the five years, 1904-08, was 35,786 tons. Sixty per cent of even this small tonnage was lumber, logs, laths and shingles—a very low class of freight which might readily have been floated in rafts on the open river.

The total traffic for the year 1908 was 23,815 tons, and more than half of that logs and lumber.

Interest on the investment ($4,574,900.00) at four per cent equals	$182,996.00
Average annual cost of operation, maintenance, etc.	43,467.27
Cost to the people of America, per annum	$226,463.27

The average tonnage of freight during the past five years has been 35,786 tons and this being carried 7.6 miles gives a total of 271,974 ton-miles, and a cost per ton-mile of eighty-three cents. If we consider

LOCK. DES MOINES RAPIDS CANAL, KEOKUK, IOWA.
Commerce on this canal costs 160 times as much as that carried by rail along its shore.

only the tonnage of the year 1908 (23,815) we find a ton-mile cost of $1.25 and a cost of $9.50 per ton for only 7.6 miles.

The eighty-three cents per ton-mile is 109 times as high as the average railroad rate in the United States, and the $1.25 is 162 times as high, and yet these figures do not include the tariff charges imposed by the boats, which are placed at about seventy-five per cent of the rail rates, in a vain effort to attract freight from the railroads. The average annual cost of the canal ($226,463.27) would at average railroad rates (0.76 cents) pay for moving the 23,815 tons of the canal traffic for 1908, over 1,200 miles—or about the railroad distance from St. Paul to New Orleans. We have no information as to the distance that the "lumber and logs" that go through the canal are floated, but they might

just as well go down the open river in rafts that require less than two feet of water. The packet boat traffic that uses the canal is practically all short-haul local freight from Keokuk to villages between there and Burlington. It is doubtful whether the average distance carried is as much as twenty-five miles.

If one should argue that the original investment ought not to be considered because that blunder cannot now be remedied, we still have an annual cost of $43,467.27 for maintenance and operation alone and that means a cost, for the tonnage of 1908, of twenty-four cents per ton-mile, which is thirty times as great as the average railroad rate, and does not include the freight charges imposed by the boats.

From any conceivable economic point of view the continued maintenance of this canal, at the expense of the Nation, is criminal folly. This needs no further proof, but perhaps the absurdity of its further maintenance may be better realized when we remember that its operation only enables the shippers who use it to save the difference between the rail rates and the water rates—about one-fourth of three-quarters of a cent per ton-mile, or 1.9 mills per ton-mile. If we assume that the average length of haul on the canal traffic is even as much as 100 miles, we have an annual saving to the shipper of only $4,524.82 at a cost to the Nation of $43,467.27. This is on the assumption that none of the tonnage could be borne on the open river, if the canal were abandoned; but that is manifestly an erroneous assumption, at least as to the lumber and logs, which constitute more than half the tonnage and could be readily floated on the river in the form of rafts.

The capital originally invested in the 7.6 miles of canal ($4,574,-900.90) would probably at that time have paid for building about 200 miles of practically level railroad, along the Mississippi River—almost exactly the distance from St. Louis via Keokuk, to Burlington. The $43,467.27 of annual cost of operating the canal would pay the railroad charges on the 23,815 tons of freight, for the entire 200 miles, with $7,268.47 to spare, and that sum, accumulating four years would doubtless pay the election expenses of any Congressman in the Mississippi Valley.

Really our "pork-barrel" politicians should study transportation problems. By doing so they could surely devise many methods for propitiating the proletariat far more effectively than by wasting the National revenues on canals and rivers.

What is the present value of the Des Moines Rapids Canal? What

would be the present value of a practically level railroad, 200 miles long, connecting St. Louis and Burlington?

Instead of our statesmen permitting the demagogues and political agitators to discourage railroad building, and ruin the roads now in operation, would it not be wise for them rather to advocate government subsidies to encourage their construction.

But the railroads do not ask for government assistance. If given a "square deal," if allowed to manage their own affairs without interference from corrupt politicians; if allowed to charge rates less than half as high as those charged by European railroads, and but a small fraction of the cost of water shipments by canal and "improved" rivers, they will continue to prosper.

The prosperity of the railroads means the prosperity of the Nation and of its citizens. When the railroads are prospering, they are constantly building new lines and improving old ones. This gives employment directly to several millions of people; and indirectly to many additional millions, in mines, at foundries, furnaces, and machine shops.

The building of new lines vastly increases taxable values in the country traversed, thereby adding to the revenues of the states; and, in addition to all this, the immense sums paid to the states, by the railroads, in the form of taxes on their properties, constitute a large per cent of the public revenues.

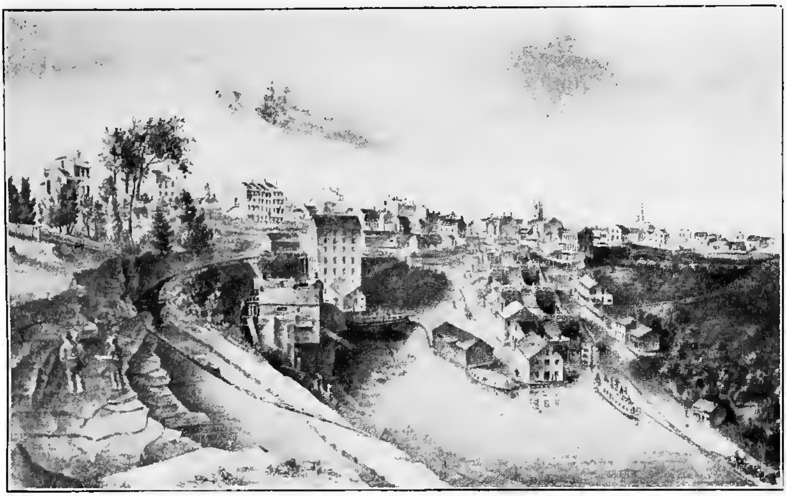
The ridiculous canals and "improved" rivers pay no taxes. Which shall we Americans build?

Erie Canal.

Buffalo to Troy, New York.

The Erie is, beyond all comparison, the most important of the American canals that are of less than twenty feet depth. It is 351.78 miles long, seven feet deep and at least seventy feet wide. Its construction was begun on July 4, 1817, and completed on October 26, 1825. There were then no railroads. The canal connects the vast navigable area of the Great Lakes with the Hudson River and the Atlantic Ocean and extends east and west in line with the traffic movement of the world. In the early days it was a great success. It was for a long time a most important factor in promoting the progress and prosperity of

the Empire State and in building up several of her great cities—New York, Albany, Buffalo, Rochester, Syracuse and others. So successful was the canal, in stimulating transportation, that it was found necessary to enlarge it, and such enlargement, begun in 1836, was completed in 1862. In the meantime, railroads were built, paralleling the canal and a competition for traffic began which was hotly waged for a long time. The Erie Canal had many advantages over the other canals of America—in its superior location; its immense established traffic; the great cities at its termini and along its borders; the fact that it



ERIE CANAL.

Reproduction of an old drawing (1830) showing the original combined locks at Lockport.

Taken from the report of the New York State Engineer and Surveyor.

was a link in a waterway connecting the Great Lakes and the Atlantic Ocean and had the Metropolis of the New World as its eastern port. In 1837, the commerce borne on the canal amounted to 667,151 tons; in 1880, it had grown to 4,608,651 tons—the maximum that it attained. The competition with the railroads has been fierce. As the railroads were perfected, they rapidly reduced tariffs and their influence "regulated rates" on the competing canal.

In 1870 the average canal rate on wheat between Buffalo and New York was 11.2 cents per bushel, in addition to which there was a toll charge of 3.1 cents per bushel, and the charge for storing was 1.25 cents,

making a total of 15.55 cents per bushel. The railroads cut under this and by 1880 the canal charges were reduced to an aggregate of 8.5 cents per bushel—nearly fifty per cent reduction. That was the year of maximum canal traffic. The railroads were, however, constantly improving their facilities and reducing their tariffs. The law of nature—"the survival of the fittest"—prevailed, and after the year 1880, the canal tonnage rapidly declined, whilst that of the railroads increased even more rapidly. In 1903, the average canal charges on wheat, including elevating and storing, had gone down to 4.5 cents per bushel (Buffalo to New York). The state, as far back as 1882,

OLD ERIE CANAL.

A mural drawing in the DeWitt Clinton High School, illustrating a scene at the ceremony of opening the Erie Canal in 1825.

(From report of the State Engineer of New York.)

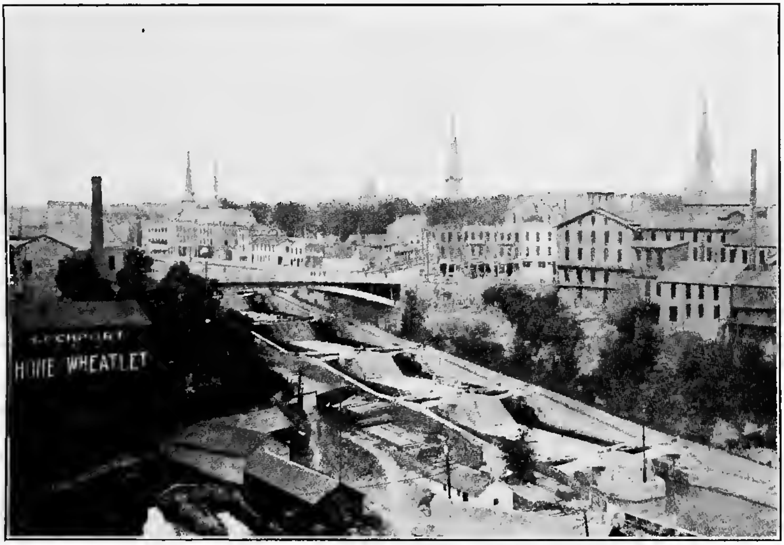
had ceased to charge any tolls, and the cost of operating and maintaining the canal had become a dead burden on the people; and yet the canal could not compete with the railroads and its commerce had shrunk to 2,414,018 tons.

A consideration of the cost of handling freight on the Erie Canal should have peculiar interest, because of the important part that waterway played in the early history of the country, and because

popular folly is now forcing the "Empire State" into an enormous expenditure to enlarge it, in the face of the absolute certainty that the money being expended is being wasted. The whole enterprise, as now being conducted, is but another example of the folly into which multitudes of people may be led when blinded by prejudice.

The following data is taken from the official "Report of the Superintendent of Public Works" of New York State for the year 1907:

The total cost of construction and enlargements, previous to the beginning of the work now in progress was $51,619,203.00, and interest on that sum at four per cent is $2,064,768.12; the cost of ordinary



ERIE CANAL, AT LOCKPORT, NEW YORK. BIRD'S EYE VIEW OF THE CONNECTED LOCKS.

View showing present appearance.

(From report of New York State Engineer and Surveyor.)

repairs and general expenses for 1907 was $581,680.53; the average annual commerce for the past ten years has been 2,242,648 tons. The reports rendered give only the tonnage and do not state the length of haul, so we are unable to compute the cost per ton-mile from that data. If we assume that the length of haul on the canal is in about the samé proportion to tonnage as on our railroads and canalized rivers, we find that the cost per ton-mile, to the people of the state is one cent. Ninety-two per cent (92 per cent) of the tonnage borne

on the canal is grain, or yet lower class freight. In addition to this, the canal-boat rates are now equivalent to 3.4 mills per ton-mile, so that the total cost to the state and individuals is 1.34 cents per ton-mile, not including cost of elevating; whilst the rate on grain on the New York Central Railroad, which parallels the canal, is .39 cents (or less) per ton-mile from Chicago via Buffalo to New York.

The actual rate of cost by rail is, therefore, but little more than one-fourth of the cost by canal, if we consider interest on investment and cost of operation and maintenance, which are items that are always included in fixing railroad tariffs. When it is remembered that in addition to this large cost for haulage, there are also the disadvantages incident to slow and uncertain movement, and the cost of breaking bulk and rehandling goods at Buffalo (and also at New York for lake tonnage bound for foreign ports), it is not hard to understand, therefore, why traffic on the Erie Canal is now less than half as great as it was thirty years ago, whilst traffic on the New York Central and Erie Railroads, competing with the canal, increased from 3,264,700 tons in 1863 to 84,168,871 tons in 1907. When we reflect that people of the state, at large, are taxed $581,680.53 per annum to maintain and operate the canal; that they obtain no revenue from an investment of $51,619,203.00; that the canal has been closed by ice for an average period of 150.3 days per annum during the past ten years, the wonder is that an intelligent people should permit a continuance of the waste and folly involved in attempting to use, in the twentieth century, a method of transportation that had ceased to be economical in the last half of the nineteenth, and is now a glaring absurdity. The competing railroads, on the other hand, pay interest on the capital invested in them; supply immense revenues to the state in the form of taxes on their property; build spur lines to every part of the country to collect the products of the labor of people and transport them to a hundred markets, quickly, safely and at far less cost than is possible by water. Which method of transportation merits the approval of progressive and patriotic Americans?

The above discussion is based on the assumption that the length of "haul" on the Erie Canal is in the same proportion to volume of traffic as is shown by the competing railroads, and by the Ohio River traffic. However probable and reasonable this assumption may be, it must still leave some doubt in the minds of impartial readers as to the reliability or accuracy of the conclusions reached.

We will, therefore, present another view of the matter.

The Statistical Abstract of the United States for 1907 (30th vol. Bureau of Statistics, Department of Commerce and Labor) gives us the following data:

The average rate, per bushel, for wheat from Chicago to New York by water (Lake and Canal) was 6.64 cents, in 1907.

In the same year the average rate by lake and rail—water from Chicago to Buffalo and rail thence to New York—was 6.93 cents. The difference in favor of the route including the canal being 0.29 cents per bushel, or 9.66 cents per ton (33 1-3 bushels equal one ton). This is merely actual charge for transportation without considering any

ERIE CANAL. AQUEDUCT OVER THE SENECA RIVER. CALLED THE RICHMOND OR MONTEZUMA AQUEDUCT.
Finished and put in service in 1856.
(From report of New York State Engineer and Surveyor.)

of the expense of operating the canal or interest on the investment therein.

The total commerce of the Erie Canal for 1907 was 2,415,548 tons and with an apparent saving of 9.66 cents per ton, the total saving, even if the entire tonnage for the whole year had been carried all the way from Buffalo to New York, would have been only $233,341.94. That this is far more than the actual saving is apparent when we consider that much of the canal tonnage was local traffic with short "haul."

To enable a small per cent of the people of the upper Mississippi

Valley to save a sum much less than $233,341.94, the State of New York maintains, at an annual cost of $581,680.53, a canal in which is invested $51,619,203.00. Stated differently, including interest on the investment, the people of New York State have an annual expense as follows:

Interest on $51,619,203.00, at four per cent................	$2,064,768.12
Annual cost of maintenance and operation	581,680.53
Total expense	$2,646,448.65

ERIE CANAL ENLARGEMENT.

View near Mindenville, showing present canal and work now in progress on project to secure a 12 foot canal, which J. J. Hill says will be "a commercially valueless shallow ditch."
(Form report of New York State Engineer.)

The apparent saving to the people of the upper Mississippi Valley is some portion of $233,341.94. The actual saving is probably nothing, since the cost of wharfage, storage, waste in transhipping and breaking bulk, lost time on account of slow speed and waterways-delays and inconveniences, doubtless consumes far more than the apparent difference in cost of shipment. The generosity of the people of New York in perpetuating this tremendously costly arrangement for the benefit of the grain shippers of Chicago is most astounding—and

Father Knickerbocker has been accused of egotism, selfishness and even of some jealousy of Chicago. How unjust!

During the past ten years the total traffic on the Erie Canal has been 22,426,480 tons and this figured at 1.34 cents per ton, as the total cost to the State and individual shippers, amounts to $35,160,235.32, whilst if hauled by the New York Central Railroad, it would have cost the State nothing and the shippers only $10,233,202.82, and there would have been a saving of $24,927,032.52.

If we adopt a different method of reasoning and say that the interest charge should be omitted from the reckoning because the investment was made when conditions were different, and, that in any case,

ERIE CANAL ENLARGEMENT.

New York is spending over $100,000,000 on "a commercially valueless shallow ditch." Scene at coffer-dams—Amsterdam, New York.
(From report of New York State Engineer and Surveyor.)

the capital is now irrecoverable, we find that the cost per ton-mile, calculated on the basis of cost of operation, renewals and maintenance alone, is 2.2 mills per ton-mile. Adding to this the 3.4 mills per ton-mile, for boat charge, we have a cost per ton-mile of 5.6 mills. At this rate the 22,426,480 tons carried on the Erie Canal, during the past ten years, has cost $14,693,829.70, whereas if carried by the New York Central Railroad it would have cost only $10,233,202.82, and there would have been a saving of $4,460,626.88.

The Erie Canal is now being enlarged to a twelve-foot depth, at an estimated cost of a little over $100,000,000. When it is completed there will be chargeable against its traffic $4,000,000 per annum, in addition to the $2,064,768.12 above mentioned, for interest on the investment. The cost of maintenance and operation of the Welland Canal, during the past seven years, has averaged $8,466.79 per mile,. If the twelve-foot Erie Canal costs $7,000 per mile, the total cost for maintenance, etc., will be $2,464,000 per annum and the annual charge against the canal traffic, for operation and maintenance and for interest on the investment will be about $8,528,768.12. There will, in addition, be the charges made by the boats of about 3.4 mills per ton-mile. There will be the same necessity for breaking bulk at Buffalo and at New York, since the boats that navigate the lakes cannot pass through the canal, and the boats and barges that will handle traffic on the canal cannot go beyond the New York harbor. The $8,528,768.12, alone, that is to be lost annually by the people of the State at large, whether the tonnage on the new canal be large or small, would pay the total railroad cost of moving 3,129,823 tons of freight from Buffalo to New York and leave a balance of $3,170,198.16. This is close to the average aggregate tonnage, per annum, of all the canals in the State, during the past ten years; and the new canal will probably never have that much commerce.

Will it pay? Jas. J. Hill said, recently, in a paper prepared to be read before the "Deep Waterways Convention," in Chicago:

> "For East and West business we have already the Great Lakes, which must be supplemented by a true deep waterway along the line of the Erie Canal, instead of the commercially valueless shallow ditch into which the people of New York are now dumping $100,000,000 in addition to what they have already spent."

Have the New York Central, the Erie and the Lackawana Railroads anything to fear from the competition of the new Erie Canal? The idea is preposterous. The Welland Canal, fourteen feet deep, connecting two of the Great Lakes, is a dismal failure, because it cannot pass the lake vessels. What hope is there for a twelve-foot canal more than twelve times as long and paralleled by some of the best low grade railroads in the world?

New York Canals.

When we consider the whole artificial waterway system of New York State, we find that there are 622.2 miles of shallow canal, the construction of which has cost $77,579,300. This does not include a large amount of costly canal that has been wholly abandoned. The total tonnage for the past seven years has been 26,970,813, which, on our assumption, based on a comparison with railroad and canalized river traffic, would give a ton-mileage of 2,405,796,519.

During the past seven years the total cost of operation, repairs and maintenance has been	$ 9,348,498.00
Interest on the investment for seven years, at four per per cent (simple interest)	21,722,204.00
Total cost to the people of the State	$31,070,702.00
Boat charges on about 2,405,796,519 ton-miles, at 3.4 mills.	8,179,708.16
Total cost chargeable against traffic	$39,250,410.16

We find, therefore, that the cost for moving freight on the New York canal, during the past seven years, has been about 1.63 cents per ton-mile; while the cost on the New York Central Railroad has been 0.39 cents per ton-mile for like tonnage—less than one-fourth as much. The cost by canal has been 12.4 mills the greater and $29,831,876.84 might have been saved if the capital had been invested in railroads and the total tonnage had been carried by rail instead of by water. Had this been done there would have been a further immense saving in avoiding the cost that has been incurred in breaking bulk and in transferring the tonnage from water to rail lines. Omitting consideration of such additional items of cost, about which we have no data, we find that the sum of $29,831,876.84 might have been saved by shipping by rail during the last seven years and that that sum would pay the cost at $35,000 per mile of building a railroad as long as all the canals (622.2 miles), with $8,054,876.84 to spare; which would have paid nearly the whole of the rail rate charges on the total bulk of freight carried.

It is evident, therefore, that canal traffic in New York State, figured on the same basis as railroad traffic, costs nearly four times as much. In addition to this tremendous disadvantage, the canal traffic is slow and uncertain and ceases wholly during a large portion of

every winter. Actual records show that the New York canals have been closed by ice for a period averaging 150.3 days per annum during the past ten years. It is not surprising, therefore, that the commerce on the New York canals has diminished from 6,673,370 tons in 1872 to 3,407,916 tons in 1907, whilst the traffic of a parallel railroad (New York Central) has increased from 1,028,183 tons to 45,967,208 tons between 1860 and 1907, although the people of the State at large pay about two-thirds of the cost of moving freight on the canals.

Welland Canal.

It were a waste of time to consider the other shallow canals in the United States. Most of them have been practically abandoned and are mere reminders that our ancestors, who built them, being human, like ourselves, could not foresee the effect of the coming of the railroad, with its cheaper, quicker and more convenient transportation and terminal facilities.

We will consider briefly the conditions at the Welland Canal (see report "Department of Railways and Canals," Canada, 1907). This waterway is 26 3-4 miles long, fourteen feet deep and its construction has cost $27,275,869.40. The last enlargement was completed in the year 1900. The total traffic handled through the canal in the seven years following this enlargement was 7,008,035 tons. This tonnage carried 26.75 miles, gives a ton-mileage of 187,464,936 for the period of seven years.

The total cost of repairs, operation and maintenance has been, for seven years, ...	$ 1,585,406.20
The interest on the investment for seven years, at four per cent, is..	7,637,243.43
Total cost to the Canadian people......................	$ 9,222,649.63

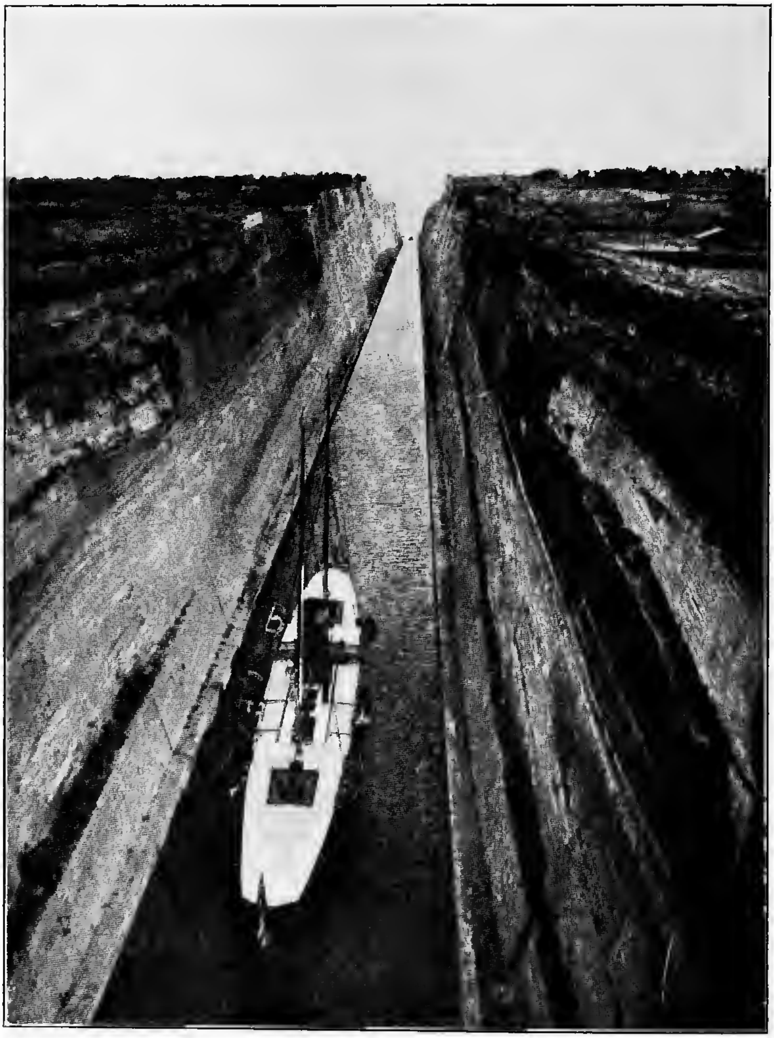
It, therefore, costs the Canadian people 4.91 cents per ton-mile to pass traffic through the canal, nearly eight times the average rate of 0.62 cents on all commodities on the New York Central & Hudson River Railroad, and probably fifteen times as much as the rail rates on the same class of commodities as are handled on the Canal. The boats handling the tonnage, of course, add their regular tariff charges.

It may be said that this is not a fair presentation of the facts since the canal is merely a short link which enables vessels to proceed on a long journey. The answer is that it is no such thing. The traffic on the Great Lakes is carried almost wholly by vessels drawing from sixteen to twenty feet of water and such vessels, when loaded, cannot pass through the Welland Canal, which is only fourteen feet deep. Herein is the explanation of the failure of the canal. If it were twenty-one feet deep, an immense traffic might pass through it, en route between the ports of Lake Ontario and those of the other Great Lakes;

THE TYPE OF LEVIATHAN IN USE ON THE GREAT LAKES.
Draws 20 feet of water and cannot pass through the Welland or Erie Canals. Scene at Sault Ste. Marie.

as it is, the canal is a failure and its average tonnage has been less in the seven years since it was enlarged, at immense cost, than in the previous seven years, though all toll charges have been discontinued since 1903. The experience gained at the Welland Canal is but another proof that inland waterways cannot now compete with railroads, unless they be large enough and so situated that they can pass vessels, or fleets of barges bearing an immense burden—probably at least 10,000 tons. The lake vessels drawing twenty feet of water carry from ten to twelve thousand tons.

Even when bottoms having a capacity of ten thousand tons, or more, may be used, the success of the waterway depends upon many other varying contingencies which we will discuss in the following



THE CORINTH CANAL.

The photograph was taken from the railroad bridge just as J. P. Morgan's yacht Corsair was passing through the canal. The canal has been a failure from a financial point of view.

pages. The Corinth Canal is twenty-six and one-fourth feet deep, but is a failure and is now for sale to the highest bidder.

As the grades and alignments of the railroads are improved and as the power of locomotives and the capacity of cars are increased, the disadvantages to be overcome by the competing waterways must steadily increase.

The government of the United States, and of the several states, could accomplish far more for the welfare of the Nation by building railroads and presenting them to individuals or corporations, who would undertake their maintenance and operation, even though allowed to charge rates double those now in effect, than can be accomplished by building canals and improving rivers. Instead of this, the owners of the existing railroads, built by corporations or individuals who provided the necessary funds, without government aid, and pay immense sums to the State for taxes on their properties, have been harassed and subjected to petty persecution. Investment in railroad securities has been discouraged. The managers, owners and builders of railroads have been abused and slandered, and an effort has been made to confiscate their properties or ruin them by subjecting them to the control of railroad commissions composed of ignorant, venal or inexperienced politicians or socialistic agitators. A continuation of such policies can result in nothing but ruin—the panic experience of the past two years may be but a foretaste.

But for the wisdom of our forefathers in establishing a Supreme Judicial Department of Government to act as a check upon the ambition of the Executive, and the folly of the people and their representatives, we should probably have made ship-wreck before the close of the last Presidential Administration.

Canadian Canals.

(See Annual Report of the Department of Railways and Canals, Dominion of Canada, 1907.)

Prior to March 31, 1907, the Canadian Government had invested $91,734,718.21 in canals of various dimensions. The "development" of this species of transportation in the "Dominion" is in line with the experience in the United States. Prior to March 31, 1880, the total investment amounted to $39,722,075.02. In that fiscal year the cost

of repairs, renewals and operation amounted to $342,206.85 and the revenue received was $341,598.14.

The total investment, prior to March 31, 1907, had reached the huge sum of $91,734,718.21, and in that fiscal year, the expenditures for renewals, repairs and operation aggregated $871,283.84, whilst the total revenue received had shrunk to $105,003.15. In a last effort to foster traffic on the canals, they have all been declared free. It seems but a question of time, and railroad construction, when all the Canadian canals, of less than twenty feet depth, must be enlarged, at huge expense, or else abandoned. The only one that can hope to compete with the railroads is the Sault Ste. Marie, which connects Lake Superior with Lake Huron. It is a little more than twenty feet deep at the lowest known stage of water, and is only 1.12 miles long.

The total water-borne traffic of the Dominion for the year 1907 was 20,543,639 tons of which 12,175,982 tons (60 per cent) was the commerce of the one-and-an-eighth-mile Sault Ste. Marie Canal—the freight borne by the railroads of the Dominion was 68,866,135 tons.

The following is a quotation from the **Annual Report of the Department of Railways and Canals of Canada** for a fiscal period ending March 31, 1907: "The total expenditure charged to capital account on the original construction and subsequent enlargements of the several canals of the Dominion up to March 31, 1907, amounts to $91,734,718.21. In addition, an aggregate of $24,495,624.73 has been expended from the consolidated fund, covering repairs, renewals, maintenance and operation of the works, making a total of $116,230,342.94. The total revenue derived therefrom, including rental of lands and water power, amounts to $13,618,586.47." And it is further stated that all toll charges have now been discontinued.

Shall we, in the United States, invest in canals or railroads?

Chapter VIII.

THE LAKES TO THE GULF DEEP WATERWAY.

(Chicago to the Gulf of Mexico.)

"In short, the vast river, Mississippi, with its many branches (extending over all the immense country of Louisiana), may safely open a communication between New Spain and Canada and between the South Sea and the Gulf of Mexico."—Inland Waterways Boomer, 200 years ago.

"Let us take up each project on its merits, and determine, by all means at our command, whether the country in which that project is to be carried out is so far developed as to justify the expenditure of a large sum of money, and whether the project will be useful when done."—W. H. Taft, President of the United States, in speech at St. Louis, October 25, 1909.

"We in this generation will do our part wisely. We will not throw money into the rivers to be washed into the sea. We shall do that first which needs most."—Joseph G. Cannon, Speaker of the House of Representatives in speech at St. Louis, October 25, 1909.

The salient features of "The Lakes-to-the-Gulf Deep Waterway," as now commonly advocated, are as follows:

First: Deepening and widening the Chicago River from its mouth, Lake Michigan, to the point at which the Chicago Drainage Canal diverges from it. Dimensions to be twenty-six feet by about 200 feet (varying in width according to limiting conditions in several localities).

This reach of waterway is six (6) miles long.

Second. Chicago Drainage Canal, extending from a connection with the Chicago River to a lock and water power plant that has been constructed in the valley of the Des Plaines River, about two miles north of the town of Joliet, Ill. This canal has a minimum depth of twenty-two feet, and when completed will be nowhere less than 160 feet wide, varying somewhat in width according to limiting local conditions.

This reach is thirty (30) miles long.

Third: A proposed extension of the above described canal from its present terminus, above Joliet, to "Starved Rock," near Utica, Ill., on the Illinois River, with the same dimensions as have already been

given the Chicago Drainage Canal—twenty-two feet minimum depth and not less than 160 feet wide.

This reach is to be about 61.5 miles long.

Fourth: Deepening and improving the Illinois River from "Starved Rock," near Utica, to its mouth, near Grafton, so as to give a channel not less than fourteen (14) feet deep and 200 feet wide. The distance is 229.5 miles—giving a total distance from Lake Michigan to the Mississippi River, at the mouth of the Illinois River, of 327 miles, with 97.5 miles of channel having not less than twenty-two feet depth by 160 feet width; and 229.5 miles with not less than fourteen feet depth and 200 feet width.

Fifth: Deepening the Mississippi River channel to fourteen (14) feet, between the mouth of the Illinois River and Alton harbor, by building a dam (of the movable Chanoine wicket type) just below the Burlington Railroad Bridge, at Alton, and constructing a canal from there to St. Louis harbor, at a point three-quarters of a mile above the Merchants' Bridge. The dam proposed at Alton being designed to pool the water between Alton and the mouth of the Illinois River (about 15.5 miles), so as to give not less than fourteen feet depth for navigation at all times, allowing for some dredging—the dam to be lowered when not required, in order to secure such depth. The canal, about eighteen miles long, is planned for a depth of not less than fourteen feet and a bottom width of 160.feet.

The distance, from the mouth of the Illinois River to St. Louis, by way of the proposed canal, is about thirty-eight miles.

Sixth: Producing and maintaining a fourteen (14) foot channel from St. Louis to the mouth of the Ohio River, at Cairo. Many schemes have been suggested for accomplishing this, and reams of good paper have been used up in advocating some most palpable absurdities in connection therewith. An act of Congress was approved March 2, 1907, creating a Special Board of Engineers "to examine the Mississippi River below St. Louis and report to Congress, at the earliest date by which a thorough examination can be made, upon the practicability and desirability of constructing and maintaining a navigable channel fourteen feet deep of suitable width from St. Louis to the mouth of the Mississippi River, either by the improvement of said river or by a canal or canals for part of said route." The Board, composed of most able and distinguished engineers, submitted a masterly report under date of March 2, 1907. This paper was reviewed by the Board of Engineers for Rivers and Harbors, and finally submitted

by the Chief of Engineers. All these distinguished engineers are fully agreed that it is possible to produce and maintain the fourteen-foot waterway, but that the costs involved render its construction and maintenance wholly inexpedient. This report will be discussed at some length in the following pages.

Seventh: From Cairo to the mouth of Red River it is proposed to maintain a fourteen (14) foot depth in a channel not less than 250 feet wide by continually dredging across the sand-bars or "crossings" whenever the depth threatens to become less than fourteen (14) feet. It is also proposed to complete the levee system, and to do much revetment work in order to protect the banks at vitally important points where cut-offs are threatened or where towns or cities are in danger of injury, or destruction. This portion of the river is about 762 miles long.

Eighth: From the mouth of Red River, to the Gulf of Mexico, the depth of the water is never less than fourteen feet, so that no work is required in order to secure the proposed channel. The distance from the mouth of the Red River to New Orleans is about 201.6 miles, and the distance from New Orleans to the Gulf of Mexico is 107.8 miles.

The total length of the proposed waterway is about 1,624 miles.

Before discussing the peculiar local difficulties to be overcome in each of these portions of the proposed waterway, we will consider the general conditions, which are, probably, the real cause of the abandonment by all practical men, well informed on this subject, of any hope of utilizing the Mississippi River for transportation on a large scale.

General Conditions.

The proposed "Deep Waterway" seems impracticable, from a business point of view, because of the following conditions, which cannot be remedied:

First—Cost.

The cost of construction and of subsequent maintenance would be stupendous. This phase of the matter will be discussed in the following chapters.

Second—Present and Prospective Commerce.

In the year 1908, the total volume of freight received and shipped from St. Louis, by way of Illinois River, was 15,375 tons. (See published statement of the Merchants' Exchange of St. Louis for 1908.)

Twenty-two years before, in 1886, the total amount had been 93,185 tons. The government has expended $1,515,720.77 on the improvement of the Illinois River. The State of Illinois has expended $744,747 and the city of Chicago has expended over $55,000,000 on a canal that sends 131,410 million cubic feet of water per annum into an upper tributary of the Illinois River. In spite of all this and though there is no railroad closely paralleling the river below Utica, the traffic on its waters has practically ceased, there being now only one small packet boat regularly plying on the 200 miles between Peoria and St. Louis.

In the year 1907, the traffic on the Mississippi River between St. Louis and Cairo had declined to 332,267 tons, of which 166,360 tons was coal from the Ohio River (the river traffic of the port of St. Louis declined from 2,130,525 tons in 1880 to 365,920 tons in 1908), though the government has expended on the improvement of that portion of the river alone nearly $15,000,000 and has for several years maintained an eight-foot depth, at great cost.

In the same year the total river traffic between Cairo and Memphis was 1,835,746 tons, 1,031,154 tons of which was coal and coke from the Ohio River.

About 90 per cent of this coal, coming out of the Ohio River, is the property of the Monongahela River Consolidated Coal & Coke Company and is shipped from mines on the Monongahela River above Pittsburg to points on the Mississippi River.

The total traffic between Memphis and Vicksburg was 1,661,406 tons, of which 871,034 tons was coal and coke belonging almost wholly to the above mentioned coal trust.

The total traffic between Vicksburg and New Orleans was 2,585,077 tons, of which 850,000 tons was coal and coke belonging almost exclusively to the trust.

Between Cairo and Memphis the traffic, exclusive of that of the coal trust, was only 804,592 tons. Between Memphis and Vicksburg it was only 811,406 tons, and between Vicksburg and New Orleans it was only 1,780,485 tons.

It should be remembered that the year 1907 was the most prosperous ever known in America. Statistics for 1908 will doubtless show a marked decline in commerce. The following quotation is illuminating: "The entire commerce of the Mississippi River system, including all tributaries except the Ohio, was reported in 1889 as 12,492,535 tons; while in 1906 it was only 4,304,288 tons, showing a loss of two-thirds." (See report of Deep Waterway's Board.)

The Ohio River is being improved by an enormously costly system of locks and dams, so as to give a nine-foot stage of water, and any greater depth than nine feet in the Mississippi would not benefit Ohio River commerce, or the coal trust that has nearly monopolized the traffic of that stream. It is probable that the Ohio River contribution to the Mississippi River traffic, which is the only traffic of any great consequence on the latter stream, is only temporary and will, within a few decades, decline and cease (I give facts and figures justifying this forecast, on pages 95 to 120. The above figures are taken from the Reports of the Chief of Engineers for the year 1907-1908. Since then traffic on the Mississippi River (except for coal coming out of the Ohio) has still further declined.

Since 1879, the government has expended on the Mississippi River improvement, between Cairo and New Orleans (statistics of 1906-1907) $50,730,614.84, including expenditures on levees, and on March 2, 1907, an additional special appropriation of $6,000,000 was voted, the money to be expended at the rate of $2,000,000 per annum for three years.

Traffic has practically ceased, except for the handling of coal belonging to the Monongahela River Consolidated Coal & Coke Company, of Pittsburg, Pa., and some local traffic carried in packet boats drawing from four to eight feet of water, between the larger cities, and such villages and plantations in the big bends of the river and its tributaries as have not yet been reached by modern lines of transportation.

Third—Difficulties and Dangers.

The able and distinguished engineers of the War Department have reported that it is possible to secure and maintain a fourteen-foot channel from Chicago to the Gulf, utilizing the Mississippi River. That is to say, modern science and engineering skill can overcome the mere physical difficulties, by expending vast sums of money and laboring perpetually at the task, but if effected it will be well-nigh

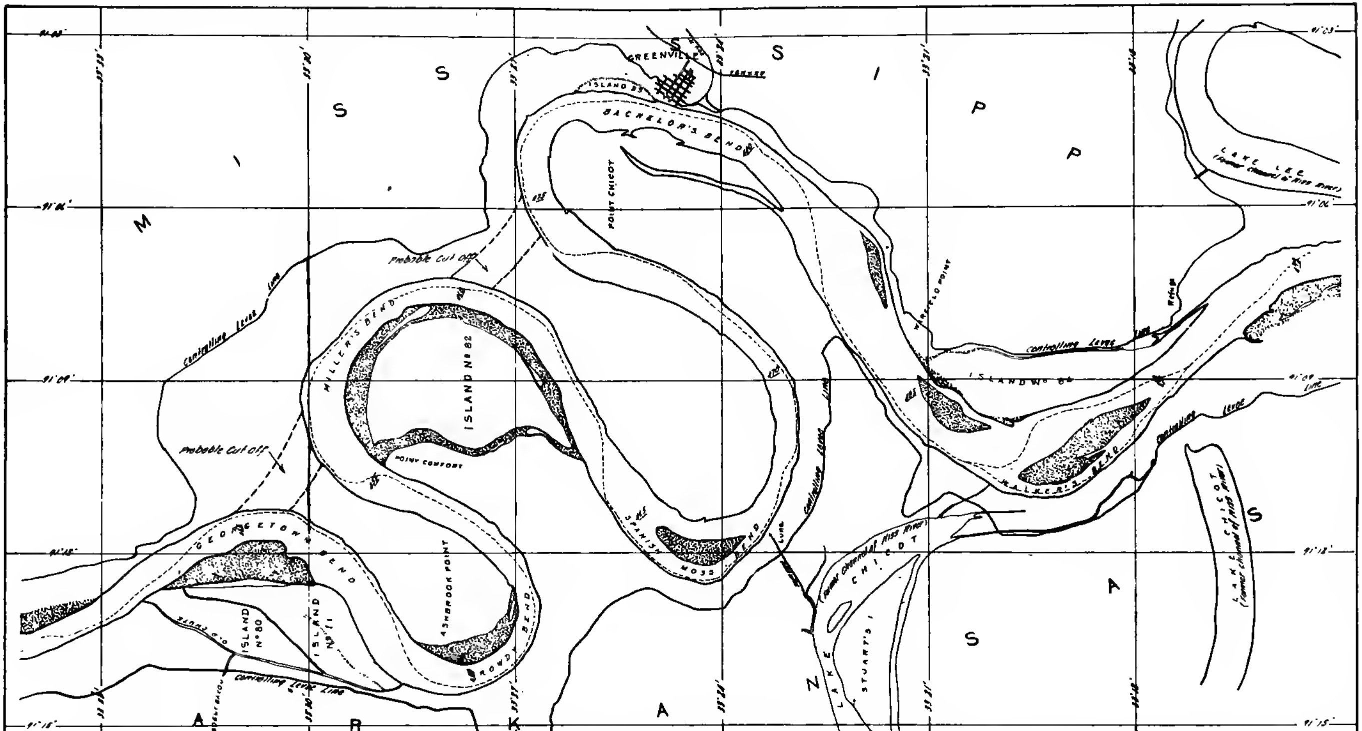
useless, and will become a memorial to the folly of the generation that labored on it, just as most of the artificial waterways that have been heretofore constructed in America are now useless, and prove that our predecessors did not foresee or understand the transportation developments that were then already in progress, and which have quickly superseded their methods and made their works abortive.

In addition to the fact that the cost of constructing and maintaining such a waterway would be stupendous, and wholly out of proportion to the present or prospective traffic on the rivers, there are many physical difficulties and limitations attending inland navigation that cannot be obviated and must, of necessity, always hamper and retard it, because they spring from laws of nature, to which all creatures are subject.

Some of the natural laws, which are adverse to inland navigation are shown by their effects as follows:

First. The large rivers have, during all the ages, varied immensely in volume between periods of flood, when the waters spread out over the wide valleys, and periods of drouth, when the waters subside within their banks, and frequently wholly cease to flow, or become mere rivulets, meandering among shoals and sand bars. The vertical variations of the Mississippi are close to fifty feet, throughout a great part of its length, and its width has often varied from a few hundred feet in drouth periods to forty miles in great floods. The levees now usually prevent such wide lateral extensions, but the variations are still such that the river is many-fold wider at some periods than at others. These conditions make it impracticable to establish permanent depots or warehouses for storing goods, awaiting river transportation or received from the river, except in a few localities. If a warehouse be built where boats can reach it in high water, probably they will not be able to get within a mile of it during the drouth period. If built at the edge of the low water channel, they will probably be submerged or swept away in the next flood-tide.

Again, the banks of the Mississippi River are constantly caving and changing the position of the channel and the course of the stream. Some towns that were once on the bank of the river are now miles away from it, and some that once prospered on its banks have been wholly destroyed and washed away by its waters. The magnitude of these changes may be appreciated when it is known that the river



MAP SHOWING TYPICAL PORTION OF THE MISSISSIPPI RIVER NEAR GREENVILLE, MISS.

(From Map Published by the Miss. River Commission)

has lost 242 miles of length by cutting off bends, within 200 years, and probably regained most of it by lengthening other bends.

Attached hereto is a map, copied from a government report, showing a typical portion of the Mississippi River, near Greenville, Miss. Unless the National Government spends immense sums to protect the banks with revetment work, it is highly probable that the "proposed cut-offs" shown will actually occur. A gentleman in Greenville pointed to the middle of the river and told me that his office had once been somewhere in that vicinity.

Business men, familiar with these facts, and perceiving that it is impossible to establish or maintain permanent warehouses for storage, at which boats can receive and discharge freight, and that it is equally impossible to establish or maintain economical facilities for the interchange of traffic between the railways and the boats, have abandoned any hope of taking advantage of the fact that it is theoretically cheaper to move heavy freight on water than on land, because the cost of transferring from land to water and back again, when at all feasible, is far greater than the difference in the cost between hauling freight on land and floating it on water.

During high water periods, lasting many weeks, it is frequently impossible for the people living along the river to get their teams to the steamboat landings and equally impossible for the boats to get within long distances of dry ground on which to deliver goods. Usually during such periods—lasting many weeks at a time—the boats suspend operations, or only make occasional trips to the few more favored ports where towns are built on the sides of hills or bluffs that extend to the water's edge. At such points it is nearly always possible to effect a landing in the vicinity of the town. The landings at St. Louis, Mo., and at Memphis, Tenn., are of this character, and are probably the best on the Mississippi, between the mouth of the Missouri River and New Orleans. Yet, in June, 1908, it was extremely difficult to load or unload goods, from or to, the boats at St. Louis, because of the high water which had forced the wharfboats close up to the buildings and alongside of the elevated railroad tracks. I am told that it was quite impracticable to reach the boats at St. Louis with freight during the extreme high-water period of 1903, which lasted several weeks. When the river is at flood stage the passing or landing of boats causes waves to wash the levees, thereby greatly endangering them. Boats sometimes stop running for weeks on account of this grave danger.

Owing to the impossibility of establishing and maintaining depots for river traffic (except at a few favorable locations) and to the further fact that boats cannot maintain regular schedules, persons wishing to ship goods by water usually haul them to the river bank and wait hours, sometimes whole days or nights, for the coming of a boat, without protection from the weather for themselves, their teams or their goods. It happens quite frequently, in periods of extreme low water, or extreme high water, that when the boat does come, it is found impossible for it to effect a landing, because of the formation of a sand bar, or because of some change in the channel or current. Such changes may occur within a few hours and are so frequent that they cause no surprise.

ICE GORGE OF 1875 ON SUSQUEHANNA RIVER, AT WILKESBARRE, PA.

Second. During the spring and fall dense fogs are of frequent occurrence, which hang over the river throughout the night and far into the day. They make navigation so perilous that it is not attempted, and all boats stop and tie up to the bank until the fog rises. In the upper portions of the river, heavy snow storms have the same effect, but they are not so frequent as to be a serious menace to navigation.

Third. North of Cairo the freezing of the Mississippi River frequently closes it to navigation from one to two months in a year. It has been so closed, between Cairo and St. Louis, twenty-three times within the past forty-three years and navigation wholly suspended for weeks each time—sometimes two whole months in one year. When

this ice breaks up, in the spring, great damage to boats, barges and wharves often results on some of the rivers. The swift current causes the formation of immense bodies of ice, which dam up the river until the "head" becomes irresistible; then the "ice-gorge" gives way and a torrent of water, laden with huge bodies of ice, rushes down the valley, grinding and destroying the frail timber wharves, barges and boats.

On the upper Ohio River, which is in the same latitude as the Illinois River, the destruction wrought by breaking of "ice-gorges" is sometimes very great.

North of St. Louis the frequency and duration of periods of frozen waters increase rapidly, as the higher altitudes and latitudes are attained, and the volume of water rapidly diminishes. Streams in the latitude of Chicago River and Drainage Canal and of the Illinois River are closed to navigation a part of every year, sometimes as much as three or four months in one winter. During such periods navigation must of necessity cease. The Hudson River, the mouth of which is about sixty miles farther south than Chicago, has been closed to navigation an average of 113 days per annum, during the past ten years.

Fourth. Wind storms are also frequent. During equinoctial periods they are sometimes terribly destructive to boats and barges, and always greatly endanger life and property on the river. A large portion of the boats that plied on the Mississippi River during the old days, when stage coaches and wagons were the chief carriers by land, have been destroyed by storms. A number of these were wrecked in the St. Louis harbor, by one storm, a few years ago. Recently I went down the Mississippi on a steamer. A few hours below Vicksburg a storm blew our boat, the "Senator Cordill," against the shore, where she was pinioned, for over an hour, with most of the passengers in a state of panic. The next evening I was on another boat, the "Betsy Ann." Below Natchez a dark cloud arose and, though there was little wind, the boat ran for shelter, far out into a thicket, where she remained, tied up to a tree, for about two hours. The men composing the crew of this steamer were specially timid, because the "Betsy Ann" had been partially wrecked in a wind storm a few months before.

The following item from an Evansville paper of August 5, 1908, shows something of the dangers:

"The recent heavy rains and winds have proved disastrous to the Pittsburg combine. At New Orleans, La., the combine lost four barges of coal, each containing 10,000 bushels, a greater part of which may be saver, when the river goes down. At Donaldsonville, Miss., on Thursday night, eighteen coal boats, valued at $72,000, and two pump boats, valued at $4,000, were sunk."

Fifth. During periods of high water, the steamers are in much danger—particularly at night—from floating logs. A direct "head-on" collision between a big saw log or a "dead-head" and a steamer, in a swift current will wreck any of the smaller packets, and greatly endanger the larger ones, whose hulls are of timber. During low water there is also great danger from snags. For many years the government has been attempting to keep the river free from these obstructions, but after every high rise there are many of them to be removed; some that have found recent lodgment during a period of high water and some that had long been covered up in the banks and recently exposed by a change in the channel. The Mississippi pilots and steam-boat commanders relate many thrilling experiences and hair-breadth escapes that they have experienced in their work on the river.

Sixth. The Mississippi River and its tributaries carry an enormous quantity of "silt and soil matter," which is perpetually moving slowly towards the Gulf. This is chiefly from caving banks, which the United States' engineers tell us contribute 890,000,000 cubic yards every year to clog the river in the portion thereof between Cairo and Donaldsonville. During periods of high water the banks are caving throughout the entire length of the Mississippi, from Cairo to New Orleans, on one side or the other, except for the short distances (an aggregate length of only 39.6 miles) within which the government has protected the banks by revetment work, at enormous cost (close to $200,000 per mile). Vastly the greater part of this material is merely washed from one bank and carried down the river, a short distance, and deposited on the other side, where it may rest for a few years, or until some change in the regimen of the stream above alters the direction of the currents, resulting in its taking another short trip towards the Gulf. There is, however, an immense quantity of such material constantly rolling along the bottom of the river. Some authorities say that this moving mass, in the bottom of the channel, has an average depth of ten feet. It moves, or rests temporarily, according to stages of depth of water, or the direction and

velocity of currents; all of which it is impossible to foresee or regulate. This silt is constantly forming "crossings" or sand-bars which obstruct navigation. Such bars will often form within a few hours, where there had been deep water, open to navigation, for weeks before. I was told by a gentleman, of the lower Mississippi, of a recent occurrence that is typical. The United States engineers, sounding the river, found forty feet of water in a certain place; ten days later they sounded at the same place and found only six feet. These sand-bars have always been most serious obstacles to navigation on the Mississippi River, and its tributaries, during low stages of water. Bars formed clear across the channel and stopped navigation wholly until the government put great hydraulic dredges to work, to pump this loose silt from the channel into an adjacent part of the river. Boats are frequently grounded on these sand-bars and held prisoners thereby (sometimes for weeks) until the river rises again sufficiently to set them free; they are also frequently cut off from their landings and wharves by the formation of such obstructions; they have, sometimes, been taken captive, whilst discharging and receiving cargo at some landing, or in the mouth of some tributary or estuary—an impassable sand-bar forming between them and the channel, during the time that they are so engaged.

Recently the steamer "Morning Star" was stranded at Louisville and held for several days, in imminent danger of serious damage.

It seems that whilst temporarily tied up to the bank, near the locks, the current washed sand in under her, forming a bar which left her for about ten (10) days practically on dry ground and unable to move.

Seventh. The difficulty about effecting any economical arrangement for interchange between railroads and boats on the rivers may be better understood, by persons who are not familiar with the eccentricities of the Mississippi and many of its tributaries, in the light of the following quotation from "Life on the Mississippi," by Samuel Clemens (Mark Twain), who spent many years on the river as a pilot.

The demagogues and agitators have recently made many appeals to popular prejudice against the railroads by alleging that the failure or refusal of the railroads to interchange freight and passengers with the boats has been ruinous to the river traffic. That such interchange

is impracticable or wholly impossible is perfectly clear in the light of the following quotation from Mark Twain:

"If you will throw a long, pliant apple-paring over your shoulder, it will pretty fairly shape itself into an average section of the Mississippi River, that is, the nine or ten hundred miles stretching from Cairo, Illinois, southward to New Orleans, the same being wonderfully crooked, with a brief straight bit here and there at wide intervals. The two-hundred-mile stretch from Cairo northward to St. Louis is by no means so crooked, that being a rocky country which the river cannot cut much.

"The water cuts the alluvial banks of the 'lower' river into deep horseshoe curves; so deep, indeed, that in some places if you were to get ashore at one extremity of the horseshoe and walk across the neck, half or three quarters of a mile, you could sit down and rest a couple of hours while your steamer was coming around the long elbow, at a speed of ten miles, to take you aboard again. When the river is rising fast, some scoundrel, whose plantation is back in the country, and therefore of inferior value, has only to watch his chance, cut a little gutter across the narrow neck of land some dark night, and turn the water into it, and in a wonderfully short time a miracle has happened; to wit, the whole Mississippi has taken possession of that little ditch, and placed the countryman's plantation on its bank (quadrupling its value), and that other party's formerly valuable plantation finds itself away out yonder on a big island; the old water course around it will soon shoal up, boats cannot approach within ten miles of it, and down goes its value, to a fourth of its former worth. Watches are kept on these narrow necks, at needful times, and if a man happens to be caught cutting a ditch across them, the chances are all against his ever having another opportunity to cut a ditch.

"Pray observe some of the effects of this ditching business. Once there was a neck opposite Port Hudson, Louisiana, which was only half a mile across, in its narrowest place. You could walk across there in fifteen minutes, but if you made the journey around the cape on a raft, you travelled thirty-five miles to accomplish the same thing. In 1722, the river darted through that neck, deserted its old bed, and thus shortened itself thirty-five miles. In the same way it shortened itself twenty-five miles at Black Hawk Point in 1699. Below Red River Landing, Raccourci cut-off was made (forty or fifty years ago, I think). This shortened the river twenty-eight miles. In our day, if you travel by river from the southernmost of these three cut-offs to the northernmost, you go only seventy miles. To do the same thing a hundred and seventy-six years ago, one had to go a hundred and fifty-eight miles—a shortening of eighty-eight miles in that trifling distance. At some forgotten time in the past, cut-offs were made above

Vidalia, Louisiana; at island 92; at island 84; and at Hale's Point. These shortened the river, in the aggregate, seventy-seven miles.

"Since my own day on the Mississippi, cut-offs have been made at Hurricane Island; at island 100; at Napoleon, Arkansas; at Walnut Bend; and at Council Bend. These shortened the river, in the aggregate, sixty-seven miles. In my own time a cut-off was made at American Bend, which shortened the river ten miles or more.

A SCIENTIST.

"Proving" that Cairo and New Orleans will some day be Twin-cities.

From Mark Twain's "Life on the Mississippi."

His reasoning reminds us forcibly of that employed by Mr. Roosevelt and the "Conservation Cranks," who are so anxious about the exhaustion of the national supply of **Coal, Water** and **Mud.** We have not yet heard any pleas for conservation of air or sunlight, but there is yet time for the "Illuminati" to branch forth on those subjects.

"Therefore, the Mississippi between Cairo and New Orleans was twelve hundred and fifteen miles long one hundred and seventy-six years ago. It was eleven hundred and eighty after the cut-off of 1722. It was one thousand and forty after the American Bend cut-

off. It has lost sixty-seven miles since. Consequently its length is only nine hundred and seventy-three miles at present.

"Now, if I wanted to be one of those ponderous scientific people, and 'let on' to prove what had occurred in the remote past by what had occurred in a given time in the recent past, or what will occur in the far future by what has occurred in late years, what an opportunity is here. Geology never had such a chance, nor such exact data to argue from. Nor 'development of species,' either. Glacial epochs are great things, but they are vague—vague. Please observe:

"In the space of one hundred and seventy-six years, the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi River was upwards of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three quarters long, and Cairo and New Orleans will have joined their streets together, and be plodding comfortably along under a single mayor and a mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

As a matter of fact the Mississippi River is probably about as long now as it was in 1722, since the result of a "cut-off" is an immense increase in the velocity of the current both above and below the point at which it occurs, and this increased velocity soon causes a lengthening of other bends and ultimately re-establishes the original conditions as to total length and rate of slope.

The humorist has, in the last paragraph above quoted, put into the mouth of his "scientist" some reasoning that sounds strangely familiar in these palmy days of the "Conservation Craze," and "Waterways Mania." We could almost suppose that this "scientist" of Mark Twain's creative imagination had actually appeared in the flesh in multifarious forms at the "White House Conference of the Governors," and had been reincarnated for special service on President Roosevelt's Conservation and Inland Waterways Commission.

Returning to the discussion of conditions that render transportation on the Mississippi River difficult and dangerous, and interchange between boats and railroads impracticable, we offer other quotations from Mark Twain's "Life on the Mississippi." Speaking of Napoleon,

Arkansas, once a flourishing town, which has been wholly destroyed by the river, he says:

"Yes, it was an astonishing thing to see the Mississippi rolling between unpeopled shores, and straight over the spot where I used to see a good, big, self-complacent town twenty years ago. Town that was the county seat of a great and important county; town with a big United States Marine Hospital; town of innumerable fights —an inquest every day; town where I used to know the prettiest girl, and the most accomplished in the whole Mississippi Valley; town where we were handed the first printed news of the Pennsylvania's mournful disaster, a quarter of a century ago; a town no more—swallowed up, vanished, gone to feed the fishes; nothing left but a fragment of a shanty and a crumbling brick chimney."

And again:

"We glided steadily down the river in the usual privacy—steamboat or other moving thing seldom seen. Scenery as always; stretch upon stretch of almost unbroken forest, on both sides of the river; soundless solitude. Here and there a cabin or two, standing in small openings on the gray and grassless banks—cabins which had formerly stood a quarter or half-mile farther to the front, and gradually been pulled farther and farther back as the shores caved in. As at Pilcher's Point, for instance, where cabins had been moved back three hundred yards in three months, so we were told; but the caving banks had already caught up with them, and they were being conveyed rearward once more."

Statements of Other Mississippi River Authorities.

The following statement taken from a recent official report of Judge Ray S. Reid, Waterways Commissioner of the State of Wisconsin, shows how vain are the hopes, and how impracticable the plans of those honest enthusiasts, who are advocating laws compelling railroads to interchange traffic with the waterways, "on equal terms."

"I am firmly convinced that no reasonable expenditure of money can ever make any improvement of the channel of the river at times of low water, between the mouth of the Missouri River and the Red River. There the bank of the river is composed of light material, and it seems almost as though it dissolves at times. The experience of railroad companies in attempting to protect short stretches of bank of this character is not only interesting, but instructive, and I will cite a few incidents which have occurred lately.

"The old Iron Mountain Route maintained a transfer between Bird's Point and Cairo until about the latter part of this summer, but the river suddenly took a turn at cutting into the banks at Bird's Point, and in less than thirty days the piling sustaining part of the track, was out in the middle of the river, and the steamboats were running between that piling and the bank to which it was formerly attached.

"The Illinois Central Railroad has spent large sums of money in an attempt to secure the bank at its warehouse above New Orleans, but I saw several cars which had been dropped into the river by the washing of the banks near the warehouse, on a trip I lately made down there.

"On the same trip I saw several cars in the river at Profit Island, where a railroad has erected a very expensive hoisting station, and it seems to be the general opinion that the whole plant will soon go into the river.

"At a point about twenty miles above the mouth of the Arkansas River, where a railroad had built a very expensive bridge, and placed the piers supporting one end of the draw some distance back from the water, and sunk this pier to a depth of fifty feet below the bottom of the river, the bank commenced to cut away about a month ago, and when I went past there two weeks ago, that pier had disappeared altogether, and there was not even a ripple in the water to show where it had stood.

"At Pine Bluff, Arkansas, the Government attempted to prevent the washing of the bank immediately next to the valuable business part of the city, and it seemed as if the attempt was successful, as the bank held it for several years.

"During the flood occurring there last month, the bank on the opposite side of the river commenced to cut, throwing the current at a different angle, and in a very short time the protection was washed from its place, a valuable warehouse fell into the river, and the bank washed within a few feet of a hotel said to be worth $150,000, and a very valuable court house, both of which are said to be doomed to destruction.

"Of the many million dollars' worth of work done by the Federal Government between St. Louis and New Orleans, in the way of shore protection, but little remains to be seen that is of any value whatever."

In line with the above quotations and confirmatory thereof, is the following quotation from a letter from Mr. E. A. Smith, President of the Cairo Commercial Club of Cairo, Illinois, addressed to Hon. R. S. Taylor, Member, Mississippi River Commission, and giving some figures of the actual cost of efforts to maintain lines and terminals for interchange of traffic on the banks of the Mississippi River. Mr. Smith is known as an able and progressive man. He is

President of a Cairo bank, and an enthusiastic advocate of all rational schemes for improving the transportation facilities of his city and State, and of the whole Mississippi Valley.

"I have asked the different railroads running into Bird's Point, Mo., and Wickliffe, Kentucky, for reports covering money expended by them in endeavoring to protect the river banks upon which their facilities are located, property loss by reason of inability to do so, and cost of constructing new line for the purpose of avoiding dangerous banks. The following roads have reported the amounts shown:

"St. Louis Southwestern—Bird's Point (est'd) $566,625.00. Not including loss by reason of being obliged to divert traffic to other gateways, which is estimated at $100,000.00 per annum.

"St. Louis, I. M. & S.—Bird's Point (est'd) $132,000.00.

"Illinois Central—Constructing new line made necessary by encroachment of river near Wickliffe, Ky., $563,287.51.

"Mobile & Ohio Railroad—Protecting banks of river near Wickliffe, Ky., and constructing new track by reason of inability to do so, $762,000.00."

Total amount expended on bank-protection by railways within ten miles of the mouth of the Ohio River, $2,222,625.00. In addition to this, the city of Cairo and her citizens have expended $1,451,256 on levees and bank protection, and the National Government has expended large sums on revetment works at Eliza Tow Head, and opposite Dickey Island, about five to ten miles above the mouth of the Ohio.

All these difficulties that limit the possibilities of economical transportation, on the Mississippi, are also encountered in an exaggerated form on the Missouri River, and most of them are found, to a greater or less degree, on the lower Ohio, and on all the important tributaries that empty into the Mississippi below the mouth of the Ohio.

The difficulties above described cannot be overcome, and make it forever impracticable for transportation by river to compete successfully with rail transportation, even between cities and villages immediately along the river banks. This statement is borne out by actual experience, wherever the two methods have come into direct competition. A candid statement which verifies this conclusion is found in a report from the Board of Engineers for Rivers and Harbors, to the Chief Engineers of the United States Army. I quote from this

report, transmitted to Congress by the Secretary of War, dated Washington, January 11, 1908 (House Document No. 492, 60th Congress, 1st Session).

"That great waterway, the Mississippi River, has been improved by the General Government, and is now being maintained from New Orleans to Cairo, at the depth proposed for the Ohio, and for several years has been maintained from St. Louis to Cairo at a depth of eight (8) feet, yet its commerce is insignificant, except what it received from the unimproved Ohio. The river commerce of St. Louis has declined from 812,185 tons, in 1895, to 370,425 tons in 1905, notwithstanding the enormous commercial growth of the city in other directions."

Since the beginning of the period mentioned (1895), the Government has expended something over $26,000,000 on the Mississippi River, between St. Louis and the Passes. Not all of this has been wasted, however, since the portion expended on the levees has resulted in much benefit to the Nation.

If the crude railroad lines in the Mississippi Valley twenty years ago, with steep grades, sharp curves, light rails, and small locomotives and cars, gave facilities so much superior to water transportation that the rivers were abandoned, after traffic had assumed huge proportions on their waters, what chance will boats on the rivers have to compete, now that grades have been reduced, curves eliminated, stone ballast and 90-pound rails laid, and when engines capable of hauling from three to five thousand tons are everywhere in service, and when an engine has recently been built which is capable of hauling a train load of over 15,000 tons on the level?

And, if the towns and manufacturing plants located on the banks of the rivers find rail transportation preferable to that by water, what chance is there for water transportation of the products of the towns, factories, and farms, located a few miles away from the rivers, when they have railroad spurs extending to their doors? A bulletin of the Bureau of Commerce and Labor, recently issued, on the subject of the "Cost of Getting Farm Products to Market," states that it has been ascertained that it costs the farmers of the country, on the average, more to haul their grain from the grain field to the railroad station than it does to pay the freight rate from the station to the market where it is sold!

Reasonable and well-informed people, living along the Mississippi, seem to realize the hopelessness of reviving river traffic, in the face of modern transportation conditions, and have not wasted money in building boats to take the places of those that have been destroyed by storms, by explosions of boilers, or in collisions with other boats, or with snags and floating logs.

A few packet boats still run between the larger river cities, and earn a precarious revenue by handling freight from those cities to such isolated villages and plantations, in the big bends of the river, or of its tributaries, as have not yet been reached by modern lines of transportation. When these boats shall have been destroyed, or when through natural decay and wear and tear of machinery, they can no longer be operated, packet-boat traffic, except for pleasure excursions, will probably cease. There will then be nothing left on the Mississippi River but pleasure boats, occasional fleets of coal barges, belonging to the great Pennsylvania coal monopoly (unless the limited coal territory from which they draw traffic shall have been exhausted by that time) and the immense fleets of Government dredges and auxiliary craft, which are engaged, a few months in each year, in the task of expending appropriations, by pumping sand and mud from one part of the river bed into another part nearby. The channel thus excavated is quickly filled in as soon as a rain causes the water to rise a few feet and the interesting process may be repeated several times in one season.

The progress of events is foreshadowed by the following news item taken from the St. Louis "Globe-Democrat," of July 31, 1908:

"The steamer, City of Savannah, of the St. Louis and Tennessee River run, will be laid off after this trip, owing to lack of patronage. The Savannah was built three years ago, and is one of the best boats on the river. She was put on the run as a companion to the City of Saltillo, but has not proven a success. 'We are taking the Savannah off the trip,' said Captain John E. Massengale, secretary of the St. Louis and Tennessee River line, yesterday, 'because she is proving a losing proposition. The truth is, the merchants of St. Louis are not doing anything to support the river trade, and, as a result, it is dwindling all the time. While they are demanding that the government spend $100,000,000 or more to produce a channel of fourteen feet through the valley, they are giving all their freight to the railroads, and I venture to say, that the majority of them scarcely know anything about the river or its trade at St. Louis. We have fourteen

feet and more, and have had it all summer, yet this has been a duller season than usual."

The insuperable difficulties attending river navigation, some of which have been mentioned above, readily supply an answer to the question, asked by many persons not familiar with the conditions, i. e., Why is it that the expenditure of about $23,000,000 on the St. Mary's Falls Canal, Detroit and St. Clair Rivers (connecting channels of the Great Lakes) has resulted in such immense and unquestioned benefit to commerce; whilst the expenditure of about $360,000,000 on our rivers has resulted in a condition about which President Roosevelt says: "In spite of large appropriations for their improvement, our rivers are less serviceable for interstate commerce today than they were half a century ago, and in spite of the vast increase in our population and commerce, they are, on the whole, less used."

But in the light of knowledge of actual conditions which limit river commerce, and the interchange of traffic between water and land carriers, what shall we think of the proposition to enact laws to "Regulate the Relations between Rail and Water Traffic," so that railroads shall be compelled to interchange traffic with the river craft, on equal terms? (See Mr. Roosevelt's Message to the Senate, transmitting the Preliminary Report of the Inland Waterways Commission.)

What a pity it is that one legislative "regulator" did not think of enacting laws to regulate the relations between the surface of the earth and the interior forces thereof!

San Francisco has suffered frightfully because Mr. Roosevelt was so busy "regulating" the rivers, mountains, forests, and deserts; and in guiding and directing "his people" in such matters as Procreations, Prosody, and Practical Politics, that he overlooked the fact that he might also have provided a preventive in the case of the San Francisco terror, instead of the remedies that he so generously applied, at the expense of the nation, but to his own honor and glory, after that horror and the similar holocaust in Italy.

Chapter IX.

CURRENT ARGUMENTS IN FAVOR OF INLAND WATERWAYS IMPROVEMENT.

"Circumstances alter cases."—Old Proverb.

Since the demagogues, muck rakers and political agitators, started the crusade against the great transportation lines that have been the chief agents in developing the country, much has been said by them, and by others, about diverting traffic to the waterways. They have issued many curious statements—some of them having an appearance of credibility—and have deceived large numbers of honest people with garbled statistics and partial quotations from official statements. Much of this stuff is absurd; for instance:

Comparisons With the Suez Canal and the St. Mary's Falls Canal.

Congressmen and Senators (even men of ability like Secretary Knox), have publicly argued about as follows:

"The expenditure of $6,033,533 in building one and six-tenths miles of canal, at St. Mary's Falls, to connect Lake Superior with Lake Huron, has resulted in great benefit to navigation. Vessels drawing 20 feet of water now proceed from Duluth to ports on Lake Erie, nearby, one thousand miles, with immense cargoes of iron ore, and return with immense cargoes of coal, at a cost, per ton-mile, far below the cost of rail transportation. Traffic has grown very rapidly, and the expenditure on the canal has been justified. Therefore, the nation should proceed at once to spend hundreds of millions of dollars in constructing a waterway, fourteen feet deep, from Chicago to the Gulf, 1,624 miles, so that vessels containing cotton, sugar and rice may be moved from New Orleans to Chicago, and return, loaded with grain and merchandise."

To the general public the utter absurdity of this is not apparent. Only a small portion of the people of the United States have seen both the Great Lakes and the Mississippi River. Among those who have seen both, only a small per cent have given any serious con-

sideration to transportation problems. It is not surprising, therefore, that the agitators, who have been trying to work up a sentiment among the citizens of the country, against the existing transportation facilities, should find it easy to deceive many honest people by such sophistries and create a popular feeling favorable to their schemes for looting the national treasury.

The contrast between conditions affecting transportation on the Mississippi and other rivers, and on the Great Lakes, is as complete as that which differentiates between transportation on our primitive mountain trails and on the streets of New York City. There is always some water in the Great Lakes and in the Mississippi River, and there is always the possibility of an active man's gaining a foot-hold on Fifth Avenue and on the mountain trails.

The Great Lakes have an aggregate area of 95,000 square miles of deep, navigable slack water, the surface level of which rarely varies more than a few inches. A moderate expenditure has created, or improved, a number of magnificent harbors, in which huge sea-going vessels can always secure convenient and commodious wharfage. In these harbors navigators find, ready for service, every known mechanical device for facilitating and cheapening the loading and unloading of vessels, and for transferring freight from boats to railroad cars, and vice versa. These lakes extend from east to west (not including Lake Ontario) 1,000 miles in the direction in which the chief traffic and transportation progress of the world has been moving for thousands of years. These vast inland seas are surrounded by great cities, which have grown, and are still growing, faster (probably) than any others in the world. At one end of this system of lakes are the most extensive high grade iron ore deposits yet discovered in the world; whilst near the other end of the system is one of the greatest deposits of coking coal yet discovered on earth. The construction of a canal one and six-tenths (1.6) miles long, at a total cost of $6,033,533 completed a navigable channel through which monstrous vessels, drawing twenty feet of water, and carrying 10,000 tons of freight, are enabled to make a voyage, laden with iron ore, from Duluth, on Lake Superior, to ports of Lake Erie, where they discharge the ore cargo, are quickly loaded with coal, coke, etc., and return to Duluth—a round trip of from 1,600 to 2,000 miles—thus bringing together the coal and ore which form the basis of our tremendous steel and iron industries.

The same writers and "statesmen" also argue that the comparatively moderate success of the Suez Canal is another proof that we should proceed with the mad project for "fourteen feet through the valley." This comparison is only slightly less absurd than that drawn from the success of the St. Mary's Falls Canal. The Suez Canal connects deep water in the Mediterranean Sea with deep water in the Red Sea. This was accomplished by cutting a canal ninety miles long; about sixty miles of the route being through shallow lakes, and the balance through sand-excavation. Eight miles of the distance required no excavation. It requires no locks and gives what is practically open slack-water navigation. There is only six feet difference of level, in ninety miles of distance, or less than one inch per mile of fall. The total cost of construction was about $100,000,000. It has a depth of thirty-one feet, a bottom width of 108 feet, and a surface width of at least 420 feet.

Connecting the Mediterranean Sea and the Red Sea shortens, by several thousand miles, the distance from Mediterranean and other European ports to India and the Orient; thus giving navigators engaged in a trade that had already been established for centuries, a vastly better, shorter and safer route, available for use of all seagoing vessels, for traffic in the exchange of commodities between the whole continent of Europe and the southern and eastern portions of the continent of Asia—the two most populous portions of the earth's surface. The delays and disadvantages of an eighteen hours' passage through ninety miles of canal are not comparable with those incident to the old time voyage around Africa, which was several thousand miles longer.

It seems almost idiotic to use data as to the traffic on these deep canals, connecting lakes and seas, as an argument for rushing headlong into the construction of a narrow, crooked waterway 1,624 miles long and only fourteen feet deep, which it would be impossible for sea-going vessels to use at all, except with the help of tugs, because of the swift currents and narrow channel; a waterway which is square across the route of the chief traffic and transportation development of the continent and of the world throughout its past history; where the laws of nature forbid the successful establishment of suitable wharves or facilities for loading and unloading freight, or for transferring it between boats and rail lines of transportation; where, for eleven hundred miles of the route there is not a coal mine or a known valuable ore deposit within one hundred miles of the pro-

posed waterway; where, along the route for 1,250 miles from the Gulf, there is only one city (New Orleans) having a population as great as 325,000; only one other (Memphis) having a population as great as 130,000, and only four others (Baton Rouge, Natchez, Vicksburg, and Cairo) with populations ranging as high as from 12,000 to 20,000; where the total urban population in 1,250 miles, is not over 500,000; where the cost of construction and maintenance will be stupendous, involving capitalized values of hundreds of millions of dollars; where the dangers and delays of navigation, from fog, ice gorges, wind storms, snags, floating logs, and sand-bars, in swift currents, along a narrow and crooked channel, 1,624 miles long, would prevent any reasonable man from investing money in vessels or from trusting his goods to river craft, without insurance, the cost of which, under such conditions, would be prohibitive. If one should argue that because a bridge between New York and Brooklyn is a profitable investment, a bridge should be built from Manila to Hong Kong, he would be regarded as a fool—we do not like to apply such harsh language to our waterways agitators.

St. Mary's River Canal.

In view of the preposterous arguments that have been foisted upon a gullible and long-suffering public, by such men as J. E. Ransdell, President of the National River & Harbors Congress, and by many other sophists, it may be well to consider briefly the actual cost of commerce on the two magnificent canals that have been built to improve the channel that connects Lake Superior and Lake Huron.

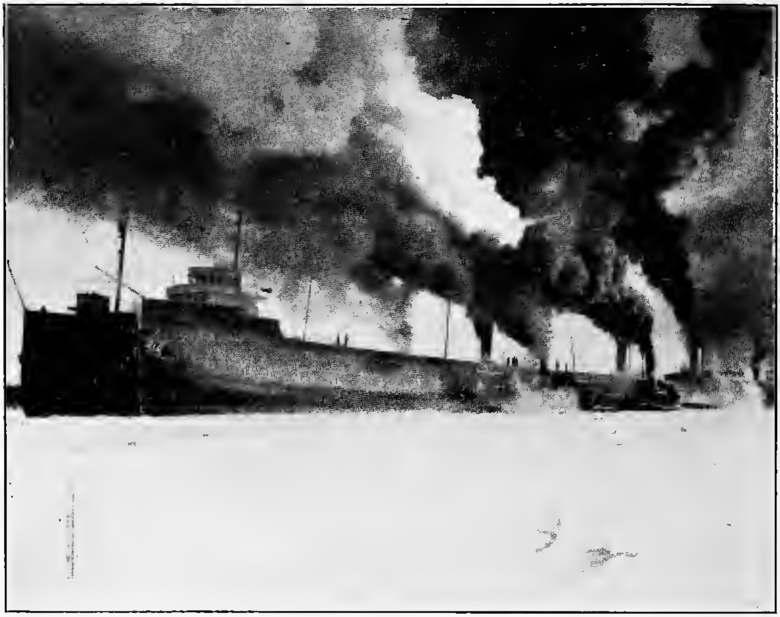
That the construction and maintenance of these two short waterways has been fully justified is certain—just as manifest as it is that, if a gate for entrance to a pasture were only large enough to accommodate calves and sheep, it would be wise for the farmer or stock dealer to enlarge it when the calves grew towards maturity, rather than to perpetually confine his enterprise to calves and sheep, because the gate was too narrow for larger animals.

If such farmer should enlarge his gate, and then decide that, because he found a five dollar investment enabled him to greatly increase his stock-raising facilities and profits, therefore, he would proceed to spend a thousand dollars in asphalting an abandoned mountain trail that had been used by pack-horses long before the

adjacent highway was built, he would be quickly put in shackles or strait-jacket by his family and friends.

Why do not our industrious legislatures enact laws for the "regulation" of our fools, knaves, and dastards? Perhaps because it is so much pleasanter to regulate one's neighbors than oneself.

The Saint Mary's River connects Lake Superior and Lake Huron. Originally there was a fall of about twenty feet at Sault Ste. Marie,



WINTER SCENE IN THE ST. MARY'S RIVER.

Tug boats trying to release monster steamers from the clutches of the ice near the American Canal.

(Picture from Putnam's Monthly, May, 1909.)

and the middle of the river being the national boundary between Canada and the United States, both nations constructed canals to facilitate and cheapen navigation on the lakes. The St. Mary's Falls Canal is on the American side of the channel. It is 1.6 miles long, and twenty-five feet deep, and cost $6,033,533.00. The Sault Ste. Marie Canal is on the Canadian side of the channel. It is 1 1-8 miles long, and twenty-two feet deep, and cost $4,639,180.62. Both canals are free, and both are used alike by American and Canadian vessels.

Considered as gateways between the two great inland seas, the investment that has been made is justified. Considered as waterways, apart from their other functions, their navigation is very costly. If we are to compare them with rivers where the whole length of the channel requires canalization (as in the case of the Ohio River, which is 967 miles long), or else costly and perpetual dredging (as in the case of the Lower Mississippi River, from Cairo to New Orleans, which is 966 miles), we can consider only the length of the canal proper, in making comparisons.

We have, in this case, two waterways, with an aggregate length of 2.73 miles, the construction of which cost $10,672,713.62. This at four per cent gives an annual interest charge of $426,908.54.

The cost of operating and maintaining the Canadian Canal for the fiscal year, 1906-07, was $23,811.47. The cost of operating and maintaining the American Canal for the fiscal year, 1906-07, was $91,614.19, making a total cost of $115,425.66.

This gives a total charge of $542,334.20 against the commerce of the two canals for the season of 1907.

The commerce of the Canadian Canal was 15,588,165 tons (almost double than of any other recorded season), and this, borne 1.13 miles gives 17,724,626 ton-miles.

The commerce of the American Canal was 45,013,198 tons (an enormous increase over any previous season), and this borne 1.6 miles gives 72,021,117 ton-miles. The total, therefore, is 89,745,743 ton-miles, at a cost of $542,334.20, or a ton-mile cost of 0.6 cents In addition to this there is a ton-mile cost of .08 mills for expenses of the freighters, making a total rate of .68 cents per ton-mile. The rate charged by the Chesapeake & Ohio Railroad on coal, in carload lots between the Kanawha coal fields and Cleveland, on Lake Erie, is .185 cents. Therefore the actual cost of commerce on these canals during the year 1907, in which far the largest commerce ever known was borne upon them, was nearly four times as great as the cost of hauling the same class of freight on one of our railroads. If we consider the commerce of any other year than 1907, we find the cost per ton-mile on the canals far greater—for instance, an average for the years 1904 to 1906 for the Canadian Canal shows 6,432,770 ton-miles, and a cost of 3.18 cents per ton-mile—seventeen times as great as the railroad rate above quoted!

In a speech delivered before the Congress of the United States on March 1, 1909, J. E. Ransdell, the leading advocate of waterways improvements in the United States, President of the National Rivers and Harbors Congress, argues as follows:

THE SAULT STE. MARIE CANAL, MICHIGAN.
The steamship North-West is passing through the Weitzel Lock.

"The commerce through the Sault Ste. Marie Canal during the season of 1907, according to accurate statistics of the United States Engineers in charge, was 58,217,214 tons."

The reader will please observe that the canal mentioned by this chief waterway boomer is in Canada, therefore the United States Engineers have nothing to do with it. Observe, also, that the commerce of the canal mentioned was actually 15,588,165 tons, instead of 58,217,214 tons, as stated by this representative waterways "Statesman."

He proceeds as follows: "The commerce through the Sault Ste. Marie Canal, during the season of 1907, as shown above, was 58,217,214 tons, carried an average of 828.3 miles, at eight one-hundredths of one mill, per ton, per mile." The reader will please note that the actual length of the canal is only 1 1-8 miles, and that the actual ton-mile cost of "commerce through the canal" for the year 1907 was 1.15 cents per ton, per mile, and that during the three years previous to 1907 it had been 3.18 cents per ton, per mile.

Did the "Statesman" confound the length of the canal with that of the whole system of lakes, or was he merely trying to cause his hearers to make that blunder? Our orator then proceeds, in a muddle of confusion, to claim that the tonnage (falsely stated) of the canal, carried 828.3 miles at .08 cents (rate utterly erroneous), gave a total cost of $38,457,345, for 48,221,318,356 ton-miles, which he suddenly transmagnified from the canal 1 1-8 miles long, to the 828 miles of the whole system of lakes. He then proceeds to confound his hearers with a confusion of guesses, gratuitous assumptions, and erroneous statements, as to the water-borne traffic of the Ohio River—its amount and cost, and as to the water-borne traffic of all the balance of the waterways of the United States, which last he arrived at, in one fell swoop, by guessing, straight-out. As a result of this jumble of guesses, false statements, and erroneous assumptions, he reached the conclusion that we had, in 1907, a total inland water traffic of 73,221,318,356 ton-miles, at a total cost of $78,407,345. He then took up the published statistics of railroad tonnage for the same year, and found 236,601,-390,103 ton-miles at 0.759 cents, and a total cost of $1,795,804,550.88. Then, by some inscrutable mental process, he jumped to the astounding conclusion that, by using the water instead of railroads, for the 73,221,318,356 ton-miles, there had been saved, to the "dear people," $477,000,000.00 in the year 1907. If there can be found, in the whole range of the idiotic verbosity that has been perpetrated upon the American people, during the past 133 years, anything else that is comparable with this utter assinine stupidity, Mr. Ransdell should pro-

duce it, unless he wishes to stand "wrapped in the solitude of his own originality." It is utterly impossible to meet such ravings with argument. How much was saved by carrying the commerce of the Great Lakes in boats instead of box cars? We cannot guess—no more than we can guess how much was saved by carrying the commerce that passed between New York and Liverpool in ships instead of automobiles.

If the imaginary 73,221,318,356 ton-miles of traffic had been borne on the Chesapeake & Ohio Railroad, at their rate for coal (.185 cents per ton-mile), the cost would have been $135,459,438.96; whereas, if it had been borne by water, at the rate of actual cost for the commerce on the Des Moines-Rapids Canal, for the year 1908 ($1.25 per ton-mile), the cost would have been $91,526,647,845.00, and there would have been a loss of $91,391,188,406.04, and the financial machinery of the whole world would have been wrecked in trying to pay for it.

Had it been borne by water at the average rate per ton-mile that we found prevailing on the Sault Ste. Marie Canal, during the years 1903-04-05 (3.18 cents per ton-mile), the total cost would have been $2,328,437,923.72, and the loss, as compared with the Chesapeake & Ohio Railroad rate, $2,192,978,484.76.

But all this is arrant nonsense and reminds one of attempts to solve the problems suggested to us in our infancy by one of Mother Goose's Melodies. "If all the world were water, and all the water were ink, what would us do for bread and cheese, what would us do for drink?"

The discussion of such infantile twaddle is an insult to the intelligence of the reader, and, with due apologies, we pass on.

Such men, along with many sensational magazine writers and editors, have, however, insisted upon this kind of argument, in spite of the well-known fact that there is not a canal in the world, over 100 miles long, or less than twenty feet deep, which can compete successfully with modern rail transportation lines, if the latter be not fettered by national ownership, nor crippled by unjust and unwise rate legislation.

It is manifest that legislative favoritism, effectively directed and enforced, might re-establish the old stage coach lines; even bring pack-mules and pedestrian peddlers into vogue again, as carriers, and utterly paralyze the business of the nation. But it seems certain that so long as the people of this country are free, and retain that

love of liberty and unfettered competition among men, which has, in America, made possible the most rapid increase in wealth and material prosperity yet known on the earth, it will be impossible for canals or canalized rivers, not navigable by sea-going vessels of large tonnage, to successfully compete with the railroads; except in handling in bottoms capable of bearing immense tonnage heavy low grade freight which can be carried by water, without transhipment, and without breaking bulk, from its point of origin to its final destination.

Actual experience as to the commerce on every canal and every navigable river in the United States has conclusively demonstrated this.

The consequence is that, as the superior means of transportation by rail has come into competition with the inferior means, by canal or river, the latter has been practically abandoned; except where coal, ore, stone, gravel, sand and similar substances, originating in the bed of a river, or along its banks, are still shipped by river during periods of high water, in such quantities as are necessary to supply the demands of towns or manufacturing plants also situated on the river.

These truths are being demonstrated, as we have shown in a previous chapter, even in the case of the Welland Canal, fourteen feet deep, and only twenty-six and three-fourths miles long. It connects two of the Great Lakes, on both of which are situated great cities, and on both of which an immense amount of traffic is borne. Here, most of the difficulties that render traffic on a large scale impracticable on the Mississippi River, are absent. The single circumstance of lack of sufficient depth of water to float the ships that move on the upper lakes, has made the canal a failure—traffic moving east and west, unhampered by restrictive legislation, is transferred to rail lines at ports along the coast of Lake Erie, and the Welland Canal, built in 1833, enlarged in 1871 and again in 1900, and finished only eight years ago, at a total cost of over one million dollars, per mile, is a failure. In the year 1872, 6,063 vessels bearing 1,333,104 tons of freight passed through this canal; thirty years later, in 1902, the traffic had decreased to 1,568 vessels, bearing 665,387 tons of freight—this in spite of a tremendous (many-fold) increase in population and wealth throughout the territory bordering on the lakes; and in spite of the fact that toll rates, through the canal, which were twenty cents per ton in 1884, were reduced until, in 1903, all toll charges were abolished. Traffic on all other canals and rivers of less than

twenty-foot depth, in the United States has, when exposed to competition with better and more modern transportation facilities, diminished to insignificant proportions, or been wholly abandoned, except under such conditions as are mentioned on page 155. The millions of dollars that were expended upon them have produced only monuments to human shortsightedness—of no more practical use than the Egyptian pyramids, but much more unsightly.

The Hennepin Canal, seven feet deep and eighty feet wide, recently completed, between Rock Island, on the Mississippi River, and Hennepin, on the Illinois River, seems to be a monument to something

"HENNEPIN" CANAL, OR ILLINOIS AND MISSISSIPPI CANAL.
LINING AQUEDUCT NO. 8 WITH CONCRETE.

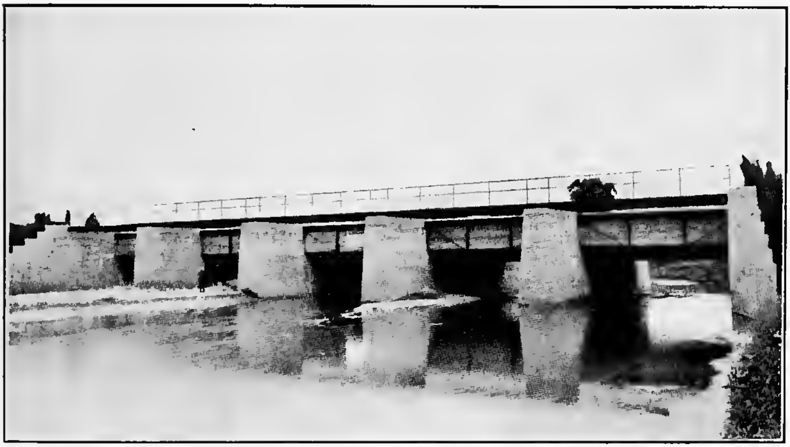
The canal is 80 feet wide, 7 feet deep, and was recently completed at a cost of $7,446,746. **Worthless** and must be abandoned.

far worse than mere shortsightedness and stupidity. In a speech made before the House of Representatives, on January 31, 1907, Congressman Burton, Chairman of the Rivers and Harbors Committee (see Congressional Record, Volume 41, Part Three, 58th Congress, 2d session, pages 2030-2031), said of it:

"I remember that about sixteen years ago there was an agitation here for the Hennepin Canal—a canal across Illinois. There was just the same airy nonchalance and contempt for expert knowledge. It was stated that we ought to leave it to business men—a very vague, indefinite statement. What is a business man? There are many different qualities of business men. Is he a boomer, who wants money spent in his locality? There was some questioning of motives

and abuse of whoever stood in its way. The Government undertook the project, and I want to say to the gentlemen of the committee, that, after six millions and a half of dollars had been spent on that Hennepin Canal, the Committee on Rivers and Harbors debated a long while whether it would be better to spend $500,000 more to finish it, or whether it would not be best to abandon it entirely."

The decision was, unfortunately, for the additional appropriation. The canal has been finished, and is, I am told, occasionally used by pleasure seekers, traveling in small gasoline motor boats.



ILLINOIS AND MICHIGAN CANAL. AQUEDUCT NUMBER 9.

From Rock Island on the Mississippi to Hennepin on the Illinois. Completed in 1908, at a total cost of $7,446,746. It is worthless and the committee on Rivers and Harbors thought of abandoning it after $6,500,000 had been expended on its construction.

The Mississippi River Between New Orleans and Baton Rouge.

Reference has been made to the failure of the Corinth Canal, which is twenty-six and one-fourth feet deep, and cost $5,000,000, though only four miles long. It shortens the distance for ships passing from the Adriatic Sea to Athens and Constantinople by about 175 miles, and shortens the distance from the Mediterranean Sea to Athens by about 100 miles. It has no locks and affords open slack water navigation. It was begun twenty-four years ago, finished fifteen years ago, is a failure, and is now advertised for sale to the

highest bidder, because shipping interests find it cheaper to make the longer journey than to use the canal.

What has been the experience in the deep water channel of the lower Mississippi River?

New Orleans has a population of about 325,000. She is one of the most important of American sea ports, and the most important of the Gulf ports. The water in her harbor is over a hundred feet deep, and vessels from all the great sea ports of the world enter and leave her docks. The variations in width and depth of the river at her wharves are comparatively slight. Her foreign trade was greatly hampered for a long time because of the shallow water in the passes at the mouth of the Mississippi, but this trouble has been overcome by the construction of the Eads jetties. The Southwest Pass is now being improved to a still greater depth and width than the old South Pass in which the first jetties were constructed. During ordinary stages of water the level at New Orleans is only eight or ten feet above the level of the Gulf, and the current in the river is no greater than that through the Suez Canal—in fact scarcely perceptible. Even in high stages of water the fall from New Orleans to the Gulf is less than two inches to the mile.

Baton Rouge, the capital of Louisiana, is a flourishing city, claiming to have a population of 22,000, situated on the bank of the Mississippi River, in the center of one of the richest agricultural regions in the world. The distance between Baton Rouge and New Orleans, by way of the Mississippi River, is 132 miles. The depth of the water in the channel is never less than forty feet, and is usually greater. Navigation is never interrupted by ice, and the vertical and lateral variations in the water stage are far less than they are higher up the river. Before railroads were built, practically all traffic between the two cities was handled by boats on the river, and there was a time when there was rarely a moment of the day or night when a big steamer was not in sight from any point along the river banks between the two cities. If there be a reach of river in America on which boats can successfully compete with the railroads paralleling it, surely this is the one. The actual results of such competition are interesting.

Two low grade rail lines have been built between Baton Rouge and New Orleans. The first one built, now a part of the Illinois Central System, is 89.4 miles long, as compared with 132 miles of river length. During the fiscal year, ending June 30, 1908, the two railroads carried from New Orleans to Baton Rouge 6,909 tons of

freight, and from Baton Rouge to New Orleans 14,847 tons, or a total of 21,756 tons. During the same period the boats on the river handled "not to exceed three hundred and fifty tons of general freight" and 2,518 bales of uncompressed cotton. Assuming that the cotton bales averaged 500 pounds weight, the total amount of interurban freight handled by all the boats was not over 979 tons. (Statement of Traffic Manager of Steamboat Traffic Association, New Orleans, July 28, 1908.)

The railroads also carried between the two cities 63,637 passengers. I tried, in vain, to get from the management of the boat lines a statement of their passenger business. Some idea of its volume may be formed in the light of the following facts.

I took passage at New Orleans in the early fall of last year, on one of the best boats plying between the two cities. We left the New Orleans wharf at five P. M. When supper was announced, I found one lonely little table set out in the big dining hall. The captain of the boat sat at the head of this convivial board, a lady and her little daughter sat at his left, a traveling fertilizer agent and a non-committal individual sat at his right and I was placed at the foot of the table. That was all. At the end of twenty-four hours our boat had reached a point about thirty-five miles below Baton Rouge.

I had grown very weary of hearing the captain and mate swear at the score or more of filthy, ragged roustabouts, as they scrambled up and down the hideous, slimy river banks. Once I timed ten men, struggling up a caving bank with a box of meat. One of the men fell into the river and was fished out by the others, and it took twenty-five minutes to carry that box fifty feet—total cost probably near $5.00, since the steamer and the balance of her crew were idle during the mud-bath performance on the shore.

If Mr. Roosevelt could have seen the banks of the river that day, and the appearance of the boxes and barrels taken from the steamer when they reached the top thereof, he would surely have changed his views about the desirability of conserving our national mud supply.

We stopped at a landing where a railroad station was within walking distance. I chose the railroad, and found that I was only twenty-five minutes from Baton Rouge. The next morning I was told that the boat had passed the city after midnight. I think it probable that the passenger traffic of the boats between New Orleans and Baton Rouge is small. I likewise think it probable that the pas-

senger traffic now handled by horse-drawn stage coaches between New York and Boston is quite limited, though the agitators are now appealing to popular prejudices, apparently with a view to popularizing stage coaches and pack-saddles.

The disadvantages inseparable from river traffic are so great that shippers naturally seek the rail line in preference; even when the shipments are between points on the bank of the river, and there is, constantly, a deep channel for navigation. Experience with commerce on the lower Mississippi supplies but another proof that it is impossible for boats, on the rivers, to compete successfully with parallel rail lines, except under conditions heretofore mentioned, which are rarely found—probably found nowhere in America, except on the Ohio River, and only of a temporary character even there.

Chapter X.

COMPARISONS AS TO SPEED AND EFFICIENCY.

"I do not think sufficient stress has been laid upon the greater rapidity of freight movement by water than by rail, and invite a study and comparison thereon."—Joseph E. Ransdell, President of the National Rivers and Harbors Congress.

The agitators are constantly asserting that the rate of speed at which freight is carried by water is greater than by rail—a manifestly preposterous assertion. They base this contention on the following facts:

The Interstate Commerce Commission Reports show that the average movement of freight cars, on American railroads, is only twenty-five miles in twenty-four hours. The "Sprague," and other tow-boats, handling coal barges, on the Ohio and Mississippi Rivers, can move 100 miles per day: ergo, freight movement by water is swifter than by rail.

The absurdity here is in comparing the steam tow-boat, which guides the barges down the river to some town, where they are left, motionless, for from three to ten months, with the freight cars that stand idle for days or weeks whilst being loaded and unloaded, and, perhaps, are not actually moving more than one-tenth of the time. The only fair comparison would, of course, be between the mileage of the barge and that of the freight car, or else between the freight locomotive and the steam tow-boat.

If the freight car averages twenty-five miles per diem, it moves 9,125 miles per annum. An official of the Monongahela Consolidated Coal & Coke Company has stated to me that the barges belonging to that company average a round trip between Pittsburg and the Mississippi River towns about once in nine months. The distance from Pittsburg to Cairo is 965 miles, and half the distance from there to New Orleans is 483 miles; so that the average movement of barges supplying coal to the towns along the Mississippi River is about 3,500 miles per annum—but little more than one-third of the average freight car movement. Barges used in supplying coal to towns on the Ohio

River probably move less than half as far, in twelve months, as those supplying the Mississippi River towns. The speed of these is only about one-sixth of that of the freight car.

Comparing the annual movement of freight locomotives with the movement of tow-boats, we find that the Louisville & Nashville Railroad Company has a line from Cincinnati, on the Ohio River, to New Orleans, on the Mississippi. On this system the average mileage of "each locomotive in freight and mixed service" was (1906-07) 41,904 miles. In passenger service it was 59,845 miles. I have been unable to obtain accurate information as to the actual distance traveled, in a year, by the "Sprague" and other tow-boats, but inasmuch as such boats do not move at all on the Ohio River, during about five months of the low-water period of each year, and cannot pass under some of the bridges during extreme high water; and cannot move during periods of heavy fog or snow storms, or during dangerous wind storms, or during periods when the Ohio River is frozen; and are frequently stranded on sand-bars or put out of commission by accidents occurring whilst they are moving; and it is only claimed that they are capable of an average service movement of 100 miles in twenty-four hours; it would seem probable that an assumption of 140 days at 100 miles, giving a total of 14,000 miles per annum, would be a liberal estimate of their actual performance—that is about one-third of the distance traveled by freight locomotives on the Louisville & Nashville Railroad, through adjacent territory. The distance from Cincinnati to New Orleans by rail is 925 miles, whereas, by water it is 1,490 miles, the railroad being shorter by 565 miles.

The above comparisons are unjust to the railroads in that they contrast through traffic on the river with all traffic on the railroads, including an immense amount of local railway business, much of it in mining, quarrying and smelting territory, where the cars are loaded at the mines, hauled ten to one hundred miles to furnaces and unloaded, with delays at both terminals.

If comparison be made with through traffic, we find fast freight trains on the Louisville & Nashville and Illinois Central Railroads, both of which parallel the Ohio and Mississippi Rivers, moving cars at an average speed of about twenty-five miles per hour, or at the rate of 600 miles per diem.

From Louisville to New Orleans the distance via the Illinois Central Railroad is 788 miles and via the Louisville & Nashville Railroad it is 811 miles, whilst by way of the Ohio and Mississippi Rivers it

is 1,332 miles, so that in making a round trip the barges are forced to travel 1,000 miles farther than the freight cars. We find that fast through freight trains move between New Orleans and Louisville in two days, whilst coal barges, if kept moving constantly, which rarely happens, take about ten times as long to make the trip—and that, as a matter of fact, barges leaving the mines above Pittsburg for Mississippi River points rarely get back in less than nine months, and are frequently gone much longer.

In the face of such facts and figures, it is evident that the statements and arguments of the boomers, who are clamoring for government bond issues, are somewhat inaccurate. Grave inaccuracies are also found in the statements of the agitators as to the cost of moving freight on these rivers, but we will postpone considering that phase of the subject until we enter upon a discussion of traffic on the Ohio River. We have more reliable data for the Ohio River, and some of its tributaries, than for the other inland waterways.

Current Statements as to the Growth of Railroad Traffic Facilities.

President Roosevelt stated in his letter of instructions to the men whom he appointed to the "Inland Waterways Commission," dated March 14, 1907, "Representative railroad men point out that the products of the Northern interior states have doubled in ten years, while the railroad facilities have increased but one-eighth."

President M. H. Smith, of the Louisville & Nashville Railroad Company, clearly demonstrated the erroneous character of this assertion in a published letter dated May 11, 1908, as follows:

"From the following statement of increases in railroad facilities for the ten years ending June, 1907, taken from compilation by Slason Thompson, Bureau of Railway News, it will be seen that the statement that they have increased but one-eighth in ten years is erroneous:

Increase In	Per Cent
Miles of line, railroads of the United States	24.1
Miles of track	35.7
Net capitalization	42.5
Gross earnings	130.5
Expenses of operation	132.0
Passengers carried one mile	130.7
Freight, tons, carried one mile	154.3
Locomotives	50.0
Locomotives, weight	100.0

Increase In	Per Cent
Passenger cars	29.0
Freight cars	63.3
Freight cars, capacity	127.0
Average tons in trains	74.0
Employes, compensation	130.8
Employes, number	103.4
Taxes	87.7

"Note that, during the period in which it is asserted that railroads increased but twelve and one-half per cent, such facilities were increased so that, with increased efficiency, the property moved in tons one mile increased 154 per cent, and passengers moved one mile increased 130 per cent, passengers and property transported by electric railways not included."

The statement quoted by Mr. Roosevelt has been repeated, **ad nauseam**, by the agitators throughout the country in spite of the fact that its erroneous nature is clearly demonstrated by the cold facts mentioned by Mr. Smith, and despite actual occurrences that have added greatly to the force of those facts. In less than thirteen months after Mr. Roosevelt stated to his Commission that "there is reason to doubt whether any development of the railroads, possible in the near future, will suffice to keep transportation abreast of production," Mr. Milton Smith's forecast had been verified, and there were over 400,000 idle freight cars standing on rusting side-tracks, scattered through all the States of the Union, and over 300,000 railroad employes had been thrown out of employment, because of the startling decrease in traffic and commerce.

The Interstate Commerce Commission statistics, for the year 1906, show that the actual increase in "railway mileage for which operations are reported," between 1896 and 1906, under the heading "Total Mileage Operated," was from 239,104.13 miles to 317,083.19 miles, an increase of 77,943.06 miles, or thirty-three per cent. Manifestly this does not include a large amount of track laid during the "boom" year 1906, but not then in operation, and it furnishes no suggestion as to the immense increase in efficiency that had been achieved, by reducing grades, eliminating curves, improving roadway, and putting in service locomotives and cars of greatly increased power and capacity.

How immensely efficiency had thus been increased may be surmised in the light of the fact that many new roads being built, and old lines being remodeled, have maximum grades of only fifteen (15) feet to one mile, whilst most of the old railroads in operation had

grades of from 53 to 106 feet per mile. A locomotive that can barely move a train load of 600 tons over a road having grades as steep as two per cent (106 feet per mile), can move a load of 2,700 tons, at a good speed, over a road having maximum grades of 0.3 per cent (fifteen feet to one mile), or a load of 2,000 tons over a road having 0.5 per cent maximum grades. A locomotive has recently been built that can pull a load of 15,000 tons on the level. How greatly the efficiency of the transportation systems had actually been improved is shown in the fact that, though the mileage had been increased only thirty-three per cent in ten years, yet the actual facilities were so greatly enlarged that "the property, in tons, moved one mile increased 154 per cent and passengers moved one mile increased 130 per cent," in ten years; whilst the "products of the northern interior states," about which so much has been said, had only increased 100 per cent in the same period.

The report of the Interstate Commerce Commission for the year ending June 30, 1907, shows that the increase in railroad track, during the previous twelve months had been 10,892.07 miles—making a total increase in eleven years, of 88,835 miles. The tremendous significance of this may be more readily grasped in the light of a comparison with railway conditions elsewhere. The Fourth Annual Report of the Bureau of Railway News and Statistics, for the year ending June 30, 1908, shows that "at last account Europe, including Great Britain and Ireland, had only 196,415 miles of line." That is to say, we had, in eleven years, built nearly half as much new railroad track, not to speak of vast improvements in old lines, as had been built on the whole continent of Europe throughout its history.

The same statistics show that we have built, in eleven years, two-thirds as much railroad as had been built on the four continents of Asia, Africa, Australia and South America in the whole history of those vast territories, composing three-fourths of the land area of the globe.

More than two years have now passed since Mr. Roosevelt accepted, without sufficient examination, the statements that he proceeded to herald abroad, by giving them the authority of his great office, and the force that resulted from his astounding popularity. During eighteen months of that period, we had practically no increase in transportation facilities, and yet, on June 30, 1909, there were, in the United States, nearly 300,000 idle freight cars, depreciating in value; several thousand idle locomotives representing a vast capital investment,

which was returning no interest; an army of over 200,000 idle railroad men, and the losses to the railroads had aggregated over $330,000,000.00. The aggregate amount of wages paid by the American railroads in 1907-08 was less by $22,137,239 than in the fiscal year 1906-07, though four months of the 1907-8 period antedated the panic.

It would appear, then, that much the heaviest portion of the "white man's burden" in America is the aggregation of petty demagogues and agitators, who deceive millions of honest and patriotic working men. These same agitators now claim a superior efficiency for waterways. "Let us judge the tree by its fruits."

The Special Report of the Census Office for 1906 entitled "Transportation by Water" gives the freight tonnage of the "Mississippi River and its tributaries" as 27,856,641 tons (probably far in excess of actual tonnage since it includes much duplication), and that of "all other inland water" (exclusive of the Great Lakes) as 3,944,655 tons—a grand total of 31,801,296 tons; whilst we find, from the report of the Interstate Commerce Commission, that the railroads of the nation hauled during the same period 1,631,374,219 tons. The rivers have been with us from the beginning; the railroads have been born within a lifetime. They are yet in their infancy, as compared with their hoary rivals; and yet they now bear five times as much freight, and the disparity is constantly and rapidly increasing. Which is the more efficient? Which is the "fittest to survive?" Which shall we, free and progressive Americans, stand by and encourage?

If the railroads of the United States are given a "square deal," they can readily keep pace with the growth of traffic. If made safe from the fear of confiscation, unjust rate regulation, interference from political agitators, and if put safely under the control of the great men, whose talents have been developed by long years of study and actual control of the several systems, they can not only keep pace with the march of national growth, but again, as during the past half century, lead that progress. If, on the other hand, the ruinous "Roosevelt Policies" have actually taken a strong and lasting hold upon the minds of American freemen; if we are actually going to substitute commissions of politicians for the trained experts who have, heretofore, managed the railroads; if we are going to place an ambitious and unscrupulous executive above Constitution, Congress and courts, and fall down before him because he amuses us with moral platitudes, whilst usurping power and destroying our liberties, then may we, indeed, wisely prepare to return to the primitive methods of trans-

portation from which China, Russia, and other nations similarly governed, have never been able to separate themselves.

Is this overdrawn? Is there no danger in conferring power upon irresponsible commissions and individuals?

Hear the answer of a great English student and thinker:

"Whatever the pretensions of any body of men may be, however smooth their language and however plausible their claims, they are sure to abuse power, if much of it is conferred on them. The entire history of the world affords no instance to the contrary." (Buckle's History of Civilization in England.)

Chapter XI.

COMPARISONS WITH TRAFFIC IN EUROPE.

"In Europe these rates are nearly two to three times as high as those prevailing in the United States.

"The average charge per ton per mile on all the railroads of this country in 1906 was .748 of a cent. The average rate in Germany was 1.352 and in France 1.428 (cents)."—James J. Hill, Chairman of the Board, Great Northern Railway.

Other hosts of agitators are arguing that, because there is considerable traffic on rivers and canals in Europe, there should be a like traffic in America. They omit to argue that, because nearly all traffic in China, until recent years, was moved on waterways, therefore, we should take to the water wholly. It would seem that such persons do not know, or prefer not to state, that the deplorable condition of European railroads in the countries cited for comparison has been brought about by government ownership or control. In 1906, the German government had acquired ownership of its railroads. In that country rail rates are placed so high, by law, that trade and traffic are forced to seek the more primitive methods of transportation by canals and rivers. The government has immense sums invested in canals and canalized rivers. Much of this investment was made before the era of railroads. Enormous vested interests in manufacturing cities, and in mining and smelting districts, located on the existing waterways, have been able to control legislation and to dictate such rates that it has been found impracticable to build railroads or develop territory that might compete with such interests.

Laws might be enacted, whereby both waterway rates and railroad rates would be made prohibitive. Such laws would force traffic to depend on wagons, stages, pack-horses, camels, or other primitive means of conveyance.

Herbert Quick says, in Putnam's Monthly for March, 1908 (page 715), that he learns from "Mr. Judson C. Welliver, of Washington, who has made careful studies of European transportation systems at the instance of the President," that in Germany

"It has been found that almost anything will go by rail, unless the rail rate is more than twenty per cent above the water rate. Therefore they (the government) forbid the railways to make a rate of less than 120 per cent of the water rate."

Mr. Welliver's dissertation, the "Relations Between Waterways and Railway Traffic in Europe" has now been published in the belated "Report of the (Roosevelt) Inland Waterways Commission." It supplies much information and many arguments that must remove any doubt that might have lingered in the minds of cautious and conservative men as to the utter absurdity of proposing to issue bonds to secure funds with which to construct inland waterways in America. Since Mr. Welliver was one of the Roosevelt emissaries, it is probably useless to say that he intended it all the other way.

Some of the railway rates on coal in America are as follows:

Chesapeake & Ohio Railroad—Kanawha coal fields to Cleveland, 1.85 mills per ton mile.

Illinois Central Railroad—Western Kentucky to New Orleans, 2.1 mills per ton-mile.

Louisville & Nashville Railroad—Through the Allegheny Mountains from Eastern Kentucky to Atlanta, Georgia, 2.65 mills per ton-mile.

Now, Mr. Welliver tells us that in Germany—where wages are lower than in the United States—the waterways rates on coal are as follows:

Antwerp to Cologne	2.1 mills per ton-mile.
Antwerp to Strasburg, via the Rhine..	2.9 mills per ton-mile.
Antwerp to Liege	6.7 mills per ton-mile.
Charleroi to Brussels	10.0 mills per ton-mile.
Charleroi to Ghent	5.2 mills per ton-mile.
Charleroi to Nancy	4.4 mills per ton-mile.

etc., etc. Whilst the government-owned railroads are required to charge rates from one to two-hundred per cent higher yet! (See page 397, Preliminary Report of the Inland Waterways Commission.) Do we wish to imitate a system that forces the transportation of such necessities of life as coal to take crooked, circuitous waterway routes, at rates from twenty to a thousand per cent higher than those at which our railroads now quickly transport the same commodity?

Shall we approve a government interference that forces the railroads to charge rates from 100 to 200 per cent higher even than those exorbitant water rates?

But we do not have to depend upon unwilling testimony from agents who have made investigations "at the instance of the President." Professor Hugo R. Meyer, of the University of Chicago, after twelve years of investigation and profound study and research, has issued a book entitled "Government Regulation of Railway Rates," the preface to which opens with the following declaration:

"This book presents the conclusions forced upon the author by a painstaking study of the railway question extending over some twelve years. That study began with an inquiry into the results of state industrial ventures in Australasia, which he took up with a strong bias in favor of state intervention in industry. As many of the most impressive lessons to be learned from the industrial experiments of the Australasian states are connected with their management of railways, the author was naturally led to make comparisons with the railways of other countries, over which the various governments have exercised some measure of control. The net result has been the disclosure of such overwhelming proofs of the evils of state direction of industry, or interference with its natural course, that he has become firmly convinced of the unwisdom of government regulation of railways or their rates."

Professor Meyer adduces conclusive proofs that the results of government ownership and regulation of railroad rates have been most detrimental to the countries in which such experiments have been made—notably in Germany, France, Austria, Russia and Australia. Development has been checked and business growth confined within narrow bounds along the coast and waterways. Railroad rates have been made double what they are in America at the same time that railroad efficiency has been greatly reduced. For instance, the paralysis of German railroad efficiency may be seen in the light of the following facts: Until within the last half dozen years the capacity of the German freight car was ten tons, and even now the average capacity is only fourteen tons, whilst the modern American freight car has a capacity of fifty tons. The average railroad freight rate, for the year 1906, in America, was .748 cents per ton-mile, and in Germany it was 1.352 cents per ton-mile.

Under existing conditions in Germany it is found almost impossible to make any radical railroad improvements, extensions, or devel-

opments, because of conflicting local interests and petty jealousies amongst the various communities and amongst the great manufacturing cities, each of which interests exercises a powerful influence in the Reichstag.

Although Germany has an Emperor, his power is far from absolute, as has recently been proven in the case of the present Emperor William, who has been humiliated by the Reichstag on account of some indiscreet, Rooseveltian, international meddling. The German government must constantly placate the various local interests, or else the necessary financial appropriations cannot be obtained, and these various petty conflicting interests playing "battledore and shuttlecock" with the railroads of the Empire, have made it impossible to develop a great system of inland rail lines. So the railroads are mere feeders to the waterways. The population is congested along the waterways. The inland country is not developed and **water rates are much higher in Germany than rail rates are in America,** though the routes are long and circuitous and the traffic slow and uncertain.

The same kind of influences which have led to so many disgraceful developments in America, in what is known as our "pork barrel" appropriations, have had their weight in producing existing transportation conditions in Germany.

Similar developments were threatened in the United States, more particularly in New York and adjoining states, in the early history of our transportation developments. Powerful men having vested interests in New York, sought to prevent the building of railroads, which "Father Knickerbocker" feared might develop rival seaports at Philadelphia and Baltimore. A fierce opposition to railroad construction existed for a while, but died because of the hard common sense of our forefathers.

J. Stephen Jeans, M. R. I., F. S. S., in "Waterways and Water Transport," says of the agitation:

"Even in the latter year (1857), the legislature of the State of New York finding that railway competition was making serious inroads upon their canal traffic, were considering whether they should not either entirely prohibit the railways from carrying freight or impose such toll on the railway tonnage as would cripple the companies in their competition with canals. * * * The two systems were, moreover, essentially antagonistic in their characteristics. The infernal activity of the railroad men was naturally most repulsive to gentlemen of

the old school, whose stately decorum was well reflected in the placid and unostentatious movements of the boats on the canal. * * * A mighty wave of popular indignation against the railroads swept over the land. 'Danger to the canals!' was the shibboleth of political parties and commercial cliques. * * * The agitation, however, came to nothing. It had no solid bottom. It was an agitation similar in kind to that which had disturbed Europe when Arkwright's spinning machine and Compton's mule were taking the place of hand labor. The clamor suddenly collapsed and was never heard of afterwards. * * * In 1870, the cost of conveying a barrel of flour from Chicago to New York was 6s. 5d.; in 1880, a working man was called on to pay only 3s. 3½d. for the same service."

Our statesmen could get much useful information if they would read Professor Meyer's book, and other similar works, instead of harkening to the preposterous assertions of ignorant or venal boomers and waterways agitators.

The policy of our government was in striking contrast with that of Germany during the period extending from 1879 to 1905. Beginning in the year 1879, the German government gradually acquired possession of her railroads, and, in order to protect investments along waterways, fixed the rates so as to force the traffic to the antiquated and unnatural water routes; whilst in the United States, until about the year 1905, the people were left free to adopt such means for transporting and marketing their products as they might find best. Since 1905, the demagogues and agitators in the United States seem to have conceived the possibility of plundering and confiscating the railroad properties, and have adopted a rapidly developing policy of persecution that resulted in temporarily crippling the business of the country and checking the progress of the Nation.

The difference between the general conditions in Germany and in the United States is so great it would be necessary to make a thorough investigation before one could determine, with certainty, to just what extent development in the two countries has been affected by these divergent transportation policies. It is certain, however, that no country can make any considerable progress in wealth without modern transportation facilities, and that other things being equal, that country will develop most rapidly whose facilities for exchanging and marketing products are the best. The assertion that **the rate of a country's development is absolutely dependent upon the character of its transportation facilities** will not be disputed by any well-informed person.

A comparison between the progress made in the United States, during the period in which the **laissez faire** policy as to transportation was in vogue, and in Germany where, during the same period, the government had acquired 31,412 miles of railroad out of a total of 34,669 miles within the Empire, and the policy of interference by compulsory rate-making had long been in vogue, will be, at least, strongly suggestive.

In 1880, the population of the United States was 50,155,783, whilst that of Germany was 45,194,172. The two countries are inhabited by races of the same parent stock—strong, virile, brave and ambitious. At the beginning of the period, the Germans had the advantage of far greater advancement in scientific knowledge and methods, whilst the United States had the advantage of larger territory.

I give below figures showing the comparative progress made by the two nations during the twenty-five-year period, extending from 1880 to 1905. The contrast in the rate of increase in population and wealth is astonishing even to persons who would have expected to find a far more rapid rate of advance in a country in which the people were left free to exchange and market their products, unhampered by government interference and compulsory rate legislation. The data used is taken from the Statesman's Year Book and other sources.

This comparison shows (see appendix one):

(1) While Germany gained fifteen million population, the United States gained thirty-four million.

(2) While Germany gained 189 million dollars in value of exports, the United States gained 616 million.

(3) While Germany gained 14,608 miles of railroad, the United States gained 124,074 miles, or nearly nine times as much.

(4) While the number of domestic animals in Germany decreased by 839,232, the number in the United States increased by 52,689,953.

(5) While Germany increased her grain production by ten million tons, the United States increased hers by forty-three million.

(6) While Germany increased her coal production by seventy-three million tons, the United States increased hers by 319 million.

(7) While Germany was compelled to increase her imports by 1,095 million dollars, the United States increased hers by only 421 million.

(8) While Germany was compelled to increase her imports of specie by fifty-eight million dollars, the United States needed less, by four million, than she did at the beginning of the period.

(9) While the German national debt increased 1,143 per cent during a period of profound peace, that of the United States increased only seven per cent, though we passed through a war during the period.

As I have suggested, it is impossible to determine just how much of the astonishing progress of the United States was due to our wiser policy as to transportation, but it is certain that our progress would have been slight, in comparison, had our government begun, in 1880, to hamper, antagonize and cripple the great transportation agencies by unjust and unwise rate-legislation and by harassing petty persecution, as has been done in recent years. Instead of receiving a steady and ever-increasing stream of immigration, such as we had during the twenty-five-year period above mentioned, we should probably have seen the current diverted to Canada where statesmen of brains and character have so far dominated public opinion that the government not only encourages railroad construction, but still grants them immense subsidies. Of the total paid-up capital of Canadian railroads in 1905—$1,248,666,414—the government aid (Federal, Provincial, etc.), amounted to $246,319,770.

It will probably be claimed that a comparison between German and American progress loses much of its force because of diverse conditions as to area and natural resources. How about Australia? That great continent is inhabited by the same race that is found in the United States. It has immense latent agricultural and mineral resources. Railroad rates are regulated by the government through a body "on the plan of our Interstate Commerce Commission." Says Professor Meyer: "Turning from the railway rate situation in the field of interstate trade and traffic in Australia, we find within several states rigid adherence to a system of tapering rates, which has resulted in a remarkable concentration of trade and industry in the leading seaboard city of each state." The rates ordered by legal authority make the development of interior towns and markets impossible. This, in turn, makes it unprofitable to produce anything that cannot, economically, stand long shipments; and this, in turn, makes railroad construction and operation unprofitable. The result is that "In 1901 there were living in the town of Sidney thirty-six per cent

of the people of New South Wales; in Melbourne, forty-one per cent of the people of Victoria; and in Adelaide, forty-five per cent of the population of South Australia." This concentration along the seaboard has been pronounced by Mr. G. H. Reid, Premier of New South Wales, to be "the curse of Australia." (See Government Regulation of Railway Rates, by Hugo R. Meyer.)

The population of Australia increased only 1,879,010 in the twenty-five years from 1880 to 1905, whilst that of the United States increased by about 35,000,000.

The value of Australian exports, during the same period, increased by only sixteen per cent, whilst those from the United States increased seventy per cent, and rose to $1,491,744,641, against a total for Australia of $276,247,430.

The number of domestic animals in Australia increased only ten per cent, while the number in the United States increased forty-three per cent, though under existing conditions stock raising is the greatest Australian industry.

Australian grain production increased only 862,408 tons, whilst that of the United States increased by 42,418,859 tons.

Australian railroad mileage increased only 10,540 miles, whilst that of the United States increased 124,074.

The Australian National debt increased during a period of profound peace by 308 per cent, whilst that of the United States increased only seven per cent, though we had a war with Spain during the period.

The development of Australia is impossible without transportation facilities, and the construction of railroads is impracticable under "government by commissions" whose members must so regulate rates as to please the inhabitants of the big coast cities, or else lose their lucrative offices. So development languishes, and a few politicians draw salaries for work that produces the lethargy.

That the adoption in the United States of the German and Australian policy would have been suicidal, has already been sufficiently demonstrated by the results of our recent experiments in government interference and rate legislation—experiments that were the chief cause of the late panic and the subsequent loss of population by emigration.

That the adoption and effective installment of an inland waterway system in the United States, similar to that in Germany, is a physical impossibility, will be clear in the light of the following facts:

The area of the United States (not including Alaska and our insular possessions) is 2,970,230 square miles. The area of Germany is 208,780 square miles, and the total length of her canals and canalized and navigable rivers was 8,433 miles, in 1903. The area of the United States is 14.23 times as great as the area of Germany. To afford our immense territory a length of navigable rivers and canals, commensurate with that now in existence in Germany, would require 14.23 times as much waterway, or 120,000 miles.

American experience as to the canalization of rivers (see Appendix No. 2), including work actually done and work estimated by the army engineers, is that the cost averages $64,087.22 per mile, in order to secure depths of four, six and nine feet.

American experience as to the building of canals for work actually done (see Appendix No. 3), is that the cost averages $206,355 per mile. But this includes canals of only four, five, six and seven feet depth, most of which are worthless and have been abandoned. If we should undertake to build canals, it seems certain none of them would be of less depth than the New Erie, which is twelve feet.

The American canals of a depth of twelve feet and over, that have been built or are now under construction, are of the following dimensions and cost (I do not include the Panama Canal, forty-nine miles long, which will probably cost not less than $500,000,000):

Name of Canal	Length in Miles.	Depth in Feet		Cost.
The New Erie Canal, (Including final enlargement and previous cost.)	351.78	12	(Estimated)	$151,619,203.00
The Chicago drainage Canal*	30	24	(Estimated)	60,000,000.00
St. Mary's Falls Canal	1.6	25		6,033,533.00
Sault Ste. Marie	1.12	22		4,639,180.62
Welland Canal	26.75	14		27,275,869.40
Lachine	8.5	14		11,597,750.78
Cornwall	11	14		7,224,284.70
Soulanges	14	14		6,904,683.58
Farran Point	1.0	14	(Enlargement)	877,090.57
Rapide Plat	3.37	14	(Enlargement)	2,158,242.00
Galops	7.33	14	(Enlargement)	6,006,626.92
Murray	5.67	14		1,248,820.26
Williamsburg	1.5	14		1,331,351.80
St. Peters	0.45	19		648,547.14
Total	464.07			$288,565,183.77

*(Not finished.)

which gives an average cost of $621,813.93 per mile. This would be increased to $1,699,237.57 per mile, if we should include the Panama Canal at an estimated cost of $500,000,000.00. We do not include it, however, because it is an unprecedented undertaking, and it is probable that nothing like it will ever again be attempted on earth.

The preliminary report of the Inland Waterways Commission states (see page ten of that report): "There are, in mainland United States, some 25,000 miles of navigated rivers and at least an equal amount which are navigable or might be made so by improvement." This evidently includes all canalized rivers and other rivers on which immense sums (over $300,000,000) have already been expended for improvement. Assuming that the report of the commission is in this one statement "thorough, conservative, sane and just," we would still require 70,000 miles of canals to give us a length of navigable waterways commensurate with that of our German rivals.

Of the 50,000 miles of navigable river, at least three-fourths, or 37,500 miles, would require canalization in order to maintain a navigable stage at all seasons.

Of the remaining 12,500 miles of "navigable" rivers, probably not more than 2,000 miles can be navigated throughout the year without the expenditure of immense sums for improvement and maintenance. This is found necessary in the Mississippi River from Cairo to the mouth of Red River, and the estimated cost of a twelve-foot channel in the Hudson River, from Troy to New York, is $5,978,576.81, including $5,121,520.02 already expended. But here we get lost in a maze of conjectures in which the expenditure of vast sums, in addition to our other estimates, looms darkly, but is intangible.

To provide our territory with a length of inland waterways commensurate with that in service in Germany in 1903, and of dimensions such as it might be found possible to use under modern conditions in America, we would require:

37,500 miles of canalized rivers, at an average cost of about $64,087.22 per mile—$2,403,270,750.

70,000 miles of canal, at an average cost of about $621,813.93 per mile—$43,526,975,100.

Total for 107,500 miles of canals and canalized rivers—$45,930,245,850.00.

12,500 miles of navigable river, at a cost of (?) for maintenance.

This $45,930,245,850.00 estimate does not include the cost of maintaining a navigable channel in 12,500 miles of river, including the por-

tion of the Mississippi between Cairo and the mouth of Red River and the Hudson between Troy and New York. In the portion of the Mississippi River last mentioned, we find (see pages 269 and 270 of this discussion) that the annual cost of maintaining a fourteen-foot channel for 762 miles would be $9,160,000.00, or a capitalized value of a little over $300,553 per mile; but we do not know what portion

HOUSE BOATS ON THE SHANEEN CANAL, CANTON, CHINA.
(From The Reader, January, 1908.)

China is one country on earth where navigation of Inland Waterways is not yet an Anachronism.

Even in China, railroads are now rapidly superseding the rivers and canals.

of the whole would require such maintenance expenditures, and must, therefore, leave out of our estimate the annual cost of maintaining a navigable channel in the 12,500 miles of river.

The adult male population of the United States is probably about 22,000,000. Ignoring the cost of maintaining a navigable stage in the

12,500 miles of "navigable rivers," and including only the $45,930,245,-850.00, estimated first cost of canals and canalized rivers, we have a per capita outlay of $2,088. This does not include the cost of renewals, maintenance and operation, which would require immense annual expenditures that we have no means of estimating. Such an expenditure were impossible, even if desirable. Since it is manifest that it is not only impossible but also that such waterways would be, for the most part, useless when completed, one should expect that even ex-President Roosevelt would desist from efforts to force the Nation into issuing bonds to obtain funds with which to prosecute their construction.

It is interesting to note that among the great nations of the world, the United States is the most prosperous and progressive, and depends almost wholly upon railroads for inland traffic and transportation, whilst China, the least progressive and the least prosperous, has for many centuries, relied almost wholly upon waterways for inland intercourse and exchange of products. The European nations range themselves between these two extremes.

Our last Executive seemed not only to desire to establish in America a one-man form of government, exercised through commissions, but also to introduce those antiquated methods of transportation that distinguish such non-progressive nations as are still governed by autocrats.

Chapter XII.

COMPARISONS WITH TRAFFIC ON THE OHIO RIVER.

"No subject of the national policy has been more distorted by partial views, more disfigured by misapprehension, or more dwarfed by the conflict of local interests than the governmental work of improving our harbors and waterways."—Senator P. C. Knox, of Pennsylvania.

Many of our "statesmen" and writers, including such men as Secretary Knox, argue that, since a considerable down-stream traffic has been found possible on the Ohio River, during a few months of each year, we should proceed to spend immense sums on the Mississippi, Missouri, Ohio and other rivers. This contention seems reasonable to many persons, who are unfamiliar with local conditions, and who have no definite knowledge about the cost of the works proposed; the cost of maintaining and operating them; the amount or character of traffic actually being handled; the developments likely to affect the duration of even the small traffic possible, under existing conditions; the justice of spending immense sums of money, collected from the people of a whole nation, when nearly all the benefit is monopolized by one great coal combine; the justice or desirability of expending immense sums from the public revenues to enable a Pennsylvania coal corporation to temporarily exclude Kentucky and Illinois and Indiana and Tennessee and Alabama coal producers from the markets of their own or adjacent states. Each of the individual citizens of a nation is, ordinarily, engrossed with his own affairs, and has neither time nor inclination to investigate general conditions. He supposes that it is a good thing to have large sums of money expended in his neighborhood, because, by that means, money is put into local circulation. The prevalence of such conditions gives the grafters opportunities of which they do not fail to take advantage.

The "statesmen" who are exploiting schemes for graft do not publish information that would turn the public against their plans for looting the National treasury in the interests of individuals, or small aggregations of capitalists, or in order to have immense sums ex-

pended in their home districts, and thereby increase their personal popularity.

Some facts about commerce on the Ohio River will make apparent the absurdity of comparing it with the Mississippi, and, incidentally, show the exceedingly questionable propriety or wisdom of expending many millions of dollars on a scheme for its canalization.

Chio River.

There are immense deposits of valuable coal in portions of the great basin drained by the Ohio River. Along certain of its tributaries —the Monongahela, Allegheny and Kanawha Rivers, in the States of Pennsylvania and West Virginia, coal is mined from a small portion of these deposits, and dumped directly from the mine cars, over tipples into barges moored to the river bank. Such barges draw from six (6) to nine (9) feet of water, are from 100 to 140 feet long, by twenty-five to twenty-eight feet wide, and may contain from six hundred (600) to a thousand (1,000) tons of coal. They may be lashed together in great fleets, carrying from ten thousand (10,000) to sixty thousand (60,000) tons of coal, and floated down the river, during stages of high water, with no expense for motive power, except that of a tow-boat to guide the fleet.

These remarkably favorable local conditions have made it possible to transport coal, at low cost, by water, from mines that are so situated that their output may be dumped directly from mining cars into barges, which, when guided by a steamboat, will float to the cities and manufacturing plants situated immediately on the banks of the lower waters of these streams and of the Mississippi River. Only a very small per cent of the coal mines in Pennsylvania and West Virginia are so situated that their owners can take advantage of this possibility.

In the year 1907, there were 1,425 coal mining operations in the State of Pennsylvania, of which number only thirty-nine shipped their whole product by river, and only thirteen others use the river at all for shipping, whilst 1,357 mines shipped their whole output by rail, and thirteen others shipped partly by rail and partly by river. The remaining sixteen are local mines

River shipments from Pennsylvania are made only from mines on the Monongahela River and a small portion of the Allegheny River. The coal territory, directly tributary to the river trade in Pennsylvania,

is quite limited, consisting of a narrow strip extending along the Monongahela River from Pittsburg, ninety miles to the West Virginia State line, and twenty-five miles along the Allegheny River. Only a portion of even this narrow strip, immediately adjacent to the river bank, is being made tributary to the river trade. Many of the mine operations, even in this narrow territory, prefer to ship by rail, so that their product may be delivered, over spurs and sidings and inclines, directly to furnaces and factories, instead of being lifted from barges in the river and trans-shipped, even a few hundred yards.

DAVIS ISLAND LOCK AND DAM—OHIO RIVER—PITTSBURG, PENNSYLVANIA.

September 15, 1908.

"The lock tenders seem to be able to maintain the pool by continuous caulking of the leaks."—Pittsburg Sun, September 14, 1908.

Most of the managers of the big furnaces and factories, located on the banks of the river, prefer to receive their coal and coke by rail—because the railroad car can be handled over spurs and inclines or elevators so as to discharge its load precisely where the contents are needed, while coal from barges must be rehandled, lifted from the river and transferred a considerable distance. All efforts to utilize the river for shipment of coal from properties that are not close to its banks have failed, except in two or three instances where remarkable local conditions exist, or where coal operators were able to force very low rates and favorable terms from railroads extending from their mines to the banks of the river. Some of the economic laws

which render forever impracticable the shipment, on a large scale, of coal from mines distant from the river banks, are as follows:

(a) In the mining regions, the river bank is accessible for rail lines at only a few points, by following the courses of the tributary creeks, and much of the available space along the important tributaries has been utilized by the main lines, or spurs, of existing railroads, which cannot afford to give operators as favorable rates for short shipments to river banks as they can for long shipments to market.

(b) The combined cost of the tipples at the mines and at the river.

(c) The high cost of river frontage, much of which is occupied by towns, villages, and trunk line railroads.

(d) The high cost of carriage for long distances, on the small mining cars; involving the building and permanent maintenance of rail lines for which right of way cannot be obtained without a charter. A charter makes the line a common carrier, where there is no traffic except that of a coal mine operated only a few months in a year.

(e) The still higher cost of using larger cars into which mine cars can dump coal at the mine tipple, and from which it can be again dumped into barges at the river; such larger cars requiring larger locomotives, heavier rails, and more costly grading, bridges, etc., and greater cost for operation and maintenance.

(f) The injury and loss to the coal in grinding it to dust in several handlings.

These and other difficulties of a local and special character make it impossible for the owners of coal properties, not on the river front, to utilize the water for economical transportation, except under rare and extraordinary conditions.

Another insurmountable difficulty that must prevent any benefit accruing to the citizens of the nation from an increase in the area of the territory from which it is practicable to ship coal by water is found in the immense cost of the plant required for such shipments. So costly is such a plant that only big monopolistic corporations can afford the outlay. If a small operator should think of utilizing the water for shipping, from a property distant from the river, he would find the above mentioned difficulties interposing themselves between him and his desire; but even if his property were on the river front, he would find the following difficulties to be overcome:

The best coal barges cost from $2,000 to $3,000 each. An effective steam tow-boat costs $120,000. The average speed of movement of coal fleets, on the river, is about five miles per hour (seven miles down

stream and three miles up stream). All the cities along the Monongahela, Allegheny, Kanawha, and Ohio Rivers, from their upper waters to the Kentucky State line, are in the vicinity of rich coal territory with markets fully supplied, so that Cincinnati and Louisville and lower cities are the nearest available river markets. Even in the last named markets the river coal must compete with coal brought in by railroad lines that are steadily reducing their rates as they reduce their grades and improve their roadbeds and rolling stock.

The small operator finds, then, that he must ship his coal at least as far as Cincinnati (over 500 miles from Monongahela and Allegheny River territory); that, with a movement of only five miles per hour his towboats will, on account of unavoidable delays, average only about 100 miles per day during the navigable season, and make a round trip in ten days; that the barges will not ordinarily be emptied and returned within six months, and may be gone ten or twelve months. Under such conditions he must provide at least two towboats, at a cost of $240,000, and probably 100 or more barges, at a cost of $200,000 to $300,000, all of which plant will deteriorate rapidly. Manifestly such expenditures cannot be made profitable except when immense shipments are being made. The small operator can usually arrange with some near-by rail line for a cheap spur track, that will place cars directly under his mine tipple, into which he can dump his coal. The railroad supplies the necessary cars and locomotives and delivers the coal at the precise spot at which it is wanted, by the furnace or factory, in a fraction of the time required for water shipment. Manifestly, the water shipment is impracticable except for the big monopoly. Hence we find that the Monongahela River Consolidated Coal & Coke Company has monopolized about seventy-five per cent of the traffic on the Ohio River between the mouth of the Great Kanawha River and Pittsburg.

Mr. William Jennings Bryan said in an address before the recent "Deep Waterways Convention" in Chicago:

"The railroad cannot rival the water course in cheapness, and there is another advantage that the water course has. When you furnish a river sufficiently deep for commerce, or a canal upon which boats can float, you make it possible for a man with small capital to act. * * * Where there is a river, any man who can build a boat can engage in transportation, and if he cannot build a big boat, he can build a little boat, and if you have a large number of little boats, the big boats will have to meet the rates that the little boats fix."

It would be difficult to compose a more illogical statement or to compress into so small a space a larger amount of nonsense. The company that has, so far, made a success of Ohio River traffic and monopolized about three-fourths of it, had (see statement of George W. Theiss, President of the Monongahela River Consolidated Coal & Coke Company, made before the Ohio River Improvement Association at Louisville, on October 22, 1908), in October, 1908, at Pittsburg, 1,100 coal barges loaded with coal; between Pittsburg and Parkersburg, 2,300 barges; seventy-five steamboats, and barges empty or loaded, scattered along the Ohio and Mississippi Rivers from Pittsburg to New Orleans, representing a total capital investment of $6,826,000.

DAM NO. 5, MONONGAHELA RIVER.
September 20, 1908.
Water three feet below top of flashboards on dam.

Under existing conditions, therefore, only fifty-two mines out of 1,425 in the State of Pennsylvania now ship by river. These few operations are confined to narrow strips of territory along the banks of the Allegheny and Monongahela Rivers, from which many other mines ship by rail. Many of these river mines have been operated on a large scale for years. Evidently the territory must be exhausted within a very limited period. Some of the "Conservation" agitators are scattering broadcast the statement that our whole national supply of coal will, even at the present rate of consumption, be exhausted within seventy years. The statement is preposterous, like most other statements from the same source, but it is highly probable that

the narrow territory along the river, from which so large a supply has been drawn during the past fifty years, and from which both the railroads and the boats are now shipping immense supplies, must be exhausted within a few decades. Mr. Bohmer, representing the Monongahela River Consolidated Coal & Coke Company in Louisville, recently stated to an assemblage of engineers and architects in that city, that the shipment of coal from the Monongahela River down the Ohio River would cease, since Pittsburg would require the entire available supply.

In the State of West Virginia there are 785 coal mining operations in progress, and only fifteen (15) of them ship their product by river. In West Virginia only thirty-eight miles of the canalized portion of the Monongahela River are in the coal field—extending from the Pennsylvania state line to Fairmont. Only thirty-five miles of the canalized portion of the Kanawha River are within the coal field. This extends from Charlestown to the head of navigation at Kanawha Falls. Within these narrow confines there are also many mines in operation that ship their product, wholly or in part, by rail.

The national government had expended, up to June 30, 1908, on the Monongahela River, $9,289,583.14; on the Kanawha River, $5,102,953.53; on the Allegheny River, $1,891,969.28. The coal operators with a portion of the narrow territories, above described, are almost the sole beneficiaries. There are no mines in Pennsylvania or West Virginia, and only a few small ones in Ohio immediately adjacent to the Ohio River, which ship by water. The tremendous expenditure proposed for its canalization would serve very little coal territory not now using the river, and would only further serve the little territory along the Kanawha, Allegheny and Monongahela Rivers. This might possibly be increased slightly by expending millions for the further canalization of a few miles of the Allegheny and Youghiogheny Rivers in Pennsylvania. No further canalization of rivers within coal fields of West Virginia is practicable, though there is a scheme for eight locks and dams to give a six (6) foot depth in the Tug Fork of Big Sandy River; and no canalization within the coal fields of Kentucky or Tennessee is practicable, though the government is wasting large sums of money on the Kentucky and Big Sandy Rivers in an effort to give slack water with six feet depth, reaching the edge of coal fields.

The Board of Engineers for Rivers and Harbors reported to the Chief of Engineers, on October 18, 1907 (see House Document No. 492, 60th Congress, 1st Session, pages 111-15), that the total traffic on the

Ohio River is about 9,350,000 tons. About this the Board makes the following statement:

"A large portion of this commerce is coal. Of the freight reported as passing through the Davis Island Dam, ninety-one per cent consists

ONE OF THE LOWER DAMS IN THE MONONGAHELA RIVER NEAR PITTSBURG. DAM NO. 1.

September 15, 1908.

of this product; through the Louisville and Portland Canal and over the falls of the Ohio at Louisville, ninety-two per cent."

About seventy-five (75) per cent of the entire shipment of freight on the Ohio River from Pennsylvania and the portion of the Monongahela River in West Virginia, belongs to the Monongahela River Consolidated Coal & Coke Company. (This company is controlled by the Pittsburg Coal Company—the latter is a Pittsburg combination —capital stock, anthorized and issued, $64,000,000, consisting of $32,000,000 common and $32,000,000, seven per cent cumulative preferred stock.) Of the balance, twenty-three per cent belongs to six other coal companies, and two per cent to all other interests. The following tabulation shows the amount of such shipments in ton-miles, the data being taken from pages 1667 to 1670 of the Report of the Chief of Engineers for the year 1907.

Table showing ton-miles of traffic on the Ohio River for all tonnage originating in Pennsylvania (being chiefly coal from Monongahela River).

Monongahela River Consolidated Coal & Coke Company	1,864,112,480	ton-miles	(75%)
Six other coal companies (Includes all their shipments on the Ohio)...	559,931,388	ton-miles	(23%)
All other traffic	40,253,392	ton-miles	(2%)
Total traffic as above stated	2,463,297,260	ton-miles	(100%)

In addition to the amount of coal handled by the Pittsburg Coal Combine, which owns seventy-five per cent of the entire river freight shipment from Pennsylvania, there are some half-dozen corporations shipping coal out of the Kanawha River. Such shipments come from West Virginia, and reach the Ohio River at Point Pleasant. The traffic from the Kanawha River, carried on the Ohio River below Point Pleasant in 1907, expressed in ton-miles, is as follows:

Business handled by coal companies	276,555,869	ton-miles, or over 98%
Business handled by other interests	39,099	ton-miles, or less than 2%.

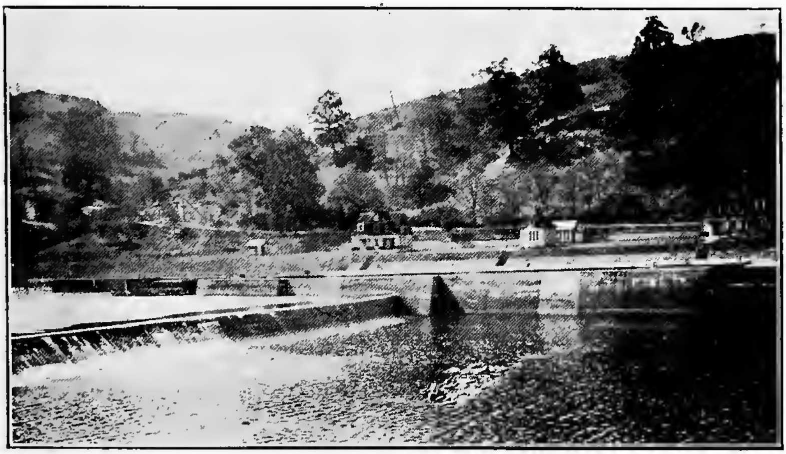
Cost of Ohio River Transportation.

Most of the coal carried on the Ohio River originates on the Monongahela and Kanawha Rivers. We will, therefore, consider the cost of handling freight on the Monongahela and Kanawha Rivers before

discussing the cost on the Ohio proper, and we will advert briefly to costs on the Allegheny River and on the Kentucky River.

The traffic borne on the Monongahela River is far greater, in proportion to navigable length, than that on any other stream in the Mississippi basin. The total amount of freight handled in the year 1908, as computed from data supplied by the reports of the Chief of Engineers, was 465,696,994 ton-miles.

The total capital investment in the Monongahela improvement to June 30, 1908, was $6,947,152.84.



LOCK AND DAM NO. 10. MONONGAHELA RIVER.
September 16, 1908.

There are five locks and dams above No. 10, on this river. The Monongahela and Ohio Packet Company have not operated above this dam the entire season, except for an occasional excursion. There are only two river coal operations above this dam. Dam almost dry, above date.

Interest on this investment at 4% is	$277,886.11
Annual cost of maintenance (Average for 4 years)	259,414.85
Total cost to the public for the year 1908 was	$537,300.96

This gives a ton-mile cost of .12 cents paid by the people of the whole Nation. In addition to this, however, there is the cost of actually handling the tonnage by boat.

Capt. William L. Sibert, Corps of Engineers, U. S. A., now a member of the Isthmian Canal Commission, who is a high authority on river transportation, and has made elaborate investigations, reports

that the average cost per ton-mile for coal handled on the Monongahela River by "A certain large steel manufacturing and furnace company in Pittsburg" is .18 cents per ton-mile. These manufacturers use over 2,000,000 tons of coal per annum and operate 180 barges and four steamboats. They own all their own plant and operate on a great scale, with everything thoroughly systematized, and on the most economical basis that is found possible. Yet the cost of handling coal is .18 cents per ton-mile, making a total cost of .3 cents per ton-mile. "On the main lines of the various railway systems, freight is being transported in train-load lots at a rate of less than .20 cents per ton-

LOCK AND DAM NO. 7. MONONGAHELA RIVER.
September 16, 1908.
This photograph shows a practically dry dam on above date.

mile. (See report of the Board of Engineers for Rivers and Harbors, House Document No. 492, 60th Congress, 1st session.) The Big Four Railroad is hauling coal in train-load lots at .186 cents per ton-mile; only sixty-two per cent of the cost of Monongahela River coal transportation. The Louisville & Nashville Railroad Company is hauling coal across the rough mountain region, between Tennessee and Kentucky coal fields and Atlanta, Georgia, for .265 cents per ton-mile. The Norfolk & Western Railway is hauling coal across the mountains from Pittsburg to the sea-board at Philadelphia at .331 cents per ton-mile, and the Illinois Central Railroad is transporting coal from

Western Kentucky to New Orleans at a rate of .21 cents per ton-mile.

It will be observed that the above river traffic figures are based on the cost of transporting coal by a big corporation, handling immense quantities, and using its own steamboats and barges. Such figures are wholly impossible for the ordinary shippers of freight, or for the man operating a small coal property. To such a one the cost would probably be doubly as great; if, indeed, river shipments were at all practicable for him.

A further examination reveals the fact that there are fifteen locks and dams in the Monongahela River, and that most of the tonnage originates below lock number five. For the upper ten locks we find the following figures: Total ton-miles in 1908, 4,826,869. Ten-fifteenths of total cost of Monongahela improvement=$4,631,435.23.

Interest on investment at 4%	$185,257.41
Annual cost of maintenance (average for 4 years)........	172,943.23
Total cost to the public	$358,200.64

This gives a cost of 7.42 cents per ton-mile, and with the added cost of .18 cents for handling by boat, we find a total cost of 7.60 cents per ton-mile for this portion of the river traffic on the Monongahela for 1908—forty times as much as it costs to haul coal in train-load lots on the Chesapeake & Ohio and the Big Four Railroad from the coal fields to Cleveland, and twenty-eight times as much as it costs on the Louisville & Nashville Railroad to haul the same class of tonnage, up and down hill, across the rough mountain country lying between Eastern Kentucky and Atlanta, Georgia, along which route there is no competing waterways to "regulate rates." These last figures are only approximate, being based on an assumption of a uniform cost of construction and also of operation and maintenance for the various locks, whilst the actual cost varies greatly.

If we consider only locks eleven to fifteen inclusive, we find a transportation of only 474,332 ton-miles in the year 1908, and, figuring on a ton mileage basis, we find that the cost to the public is as follows:

Actual cost five locks and dams (Nos. 11 to 15, inclusive) is $839,739.90.

Interest on investment at 4%	$33,589.56
Estimated cost of operation and care	69,177.28
Total cost to the people of the Nation	$102,766.84

This gives a cost of 21.66 cents per ton-mile or 116 times as great as on the railroad first above mentioned, without including boat tariff charges.

These results show that even on the Monongahela River, which is the boast of all advocates of waterways, the actual cost of transportation, under the most favorable conditions conceivable (conditions only within the reach of great monopolistic trusts), is from nearly double to 116 times as great as is the cost of transporting the same class of freight on some of the railroads of the country.

Perhaps there is nowhere in America a more flagrant example of the "pork barrel" abuse in internal improvement than is the canalization of the upper Monongahela River. Costly locks and dams have been built that are practically useless and worthless obstructions in the river channel. During several months of last year, there was not enough water in the river to fill the pools above the dams, even when no lockages were required. The locks and dams in the Monongahela River, in West Virginia, are a subject of much merriment among the citizens of the region.

Great Kanawha River.

The slack-water system on the Kanawha River consists of ten locks and dams, and the portion of the river rendered navigable is ninety miles long. The tonnage for the year 1907 was 1,728,041, and we find a ton-mileage of 92,498,527. The total capital invested in locks and dams is $4,223,830.26.

Interest on investment at 4%	$168,953.21
Cost of maintenance and operation (average for four years)	69,919.35
Total annual cost to the people of the Nation	$238,872.56

This gives a cost of .26 cents per ton-mile.

Several coal operators are shipping from the Kanawha, but none of them on anything like as large a scale as the manufacturing company at Pittsburg, on whose business Major Sibert based his calcu-

lations of the cost of transportation on the Monongahela River. The Kanawha locks afford only six feet of water, whilst the Monongahela gives seven and five-tenths to eight feet. We have no reliable figures showing actual cost of coal transportation on the Kanawha, but if it be possible to handle coal at .18 cents on the eight-foot Monongahela, in immense quantities, it will probably be possible to handle it at .28 cents on the six-foot Kanawha, in much smaller quantities. Under this assumption, we have a total average cost of .54 cents per ton-mile, which is about three times the cost at which similar freight is actually handled by the Chesapeake & Ohio Railroad (which parallels the course of the Kanawha River, but is much shorter than it) in train-

KELLY'S CREEK COAL COMPANY'S RIVER TIPPLE.

This is typical of such structures. The coal is conveyed in small cars into the house above, weighed and dumped into barges below.

lots and about twice the cost of transporting coal on the Louisville & Nashville Railroad across the rough mountain country, between Eastern Kentucky and Atlanta.

Kentucky River.

On this stream, on which $5,568,056.93 had been expended for construction, operation and care, previous to June 30, 1908, the report of the Chief of Engineers makes the following laconic remark. (See page 610 of Report of the Chief of Engineers for 1908):

"The principal commerce on the river is timber, much of it loose logs, and the improvement is rather detrimental to this than otherwise. The logs are damaged in passing the dams, and in turn cause much damage to the works," and "It is believed that the project has had so far no material effect on freight rates."

The total traffic on this river in 1907 was 209,893 tons. The capital invested in permanent improvement is $3,931,850.00.

Interest on investment at 4%	$157,274.03
Annual cost of maintenance (average for four years)......	122,591.66
Total cost to the Nation per annum	$279,865.69

In this case the ton-mileage is 26,467,459, and the cost per ton-mile is .93 cents. Here there is no competing railroad. The boat charges consequently are higher than average railroad charges, and the total ton-mile cost for all commodities is far higher than the railroad charges on similar commodities.

It is interesting to note that the $5,558,056.43, with accrued interest, would probably have built an ordinary second class railroad, extending from the mouth of the river to the head of the system of locks and dams, over which the $279,865.69 of annual cost to the people, would pay freight at the average rail rate of 0.76 cents on the 209,893 tons for 126 miles distance (that was the average length of shipments on the Kentucky River for 1906), saved to the "dear people" what they paid the boats for freight charges, left a balance of $78,872.69, and also left the stream clear of dams that now obstruct the channel and interfere with the "principal commerce on the river," which is floating timber—mostly loose logs. Such a railroad would have given a stimulus to development along its route that would have increased the value of property by many millions of dollars, and could have been leased or sold for a great sum. No rational man would accept the locks and dams as a present, if required to operate and maintain them.

Computed on the same basis we find the cost to the people of the nation, per ton, per mile, for traffic on the Allegheny River in 1909, was 2.26 cents, and the total cost including transportation by boat, 2.44 cents, as compared with 0.186 cents on the Chesapeake & Ohio R. R., and 0.265 cents on the Louisville & Nashville.

Ohio River Traffic.

Perhaps the most astonishing feature of the whole mad scheme for improvements of inland waterways is the showing made by an analysis of conditions affecting traffic on the Ohio River, which all the agitators name as **par excellence,** the river which should be improved and the one which they hold up as an object lesson to justify their schemes for spending vast sums (to be obtained by bond issue) on this and other streams, where there is no traffic existing or prospective that would justify any expenditure beyond the cost of removing snags and obstructions.

HERR'S ISLAND DAM—ALLEGHENY RIVER.
September 21, 1908.

The special "Report of Examinations of Ohio River" submitted by the Chief of Engineers, on January 10, 1908 (see House Document No. 492, 60th Congress, 1st Session), shows the following expenditures and estimates of cost:

Expended on lock and dam project, prior to March 2, 1907..	$9,281,376
Estimate to complete, subsequent to March 2, 1907........	63,731,488
Expended on Louisville & Portland Canal..................	3,960,258
Estimate to enlarge Louisville & Portland Canal..........	1,760,000
Total estimated cost of nine-foot project............	$78,679,122

This does not include $6,696,333.76, hitherto expended on general improvement.

The system will consist of fifty-four locks and dams.

The reports of the Chief of Engineers show that the cost of operations and care for one year, of the three locks (Nos. 1, 2, and 6) that were in service in 1907, was $56,027.44, or an average of $18,675.82 for each of the plants.

The three dams mentioned are away up towards the head of the river where the stream is comparatively narrow. It would seem certain that the cost, where the river is two or three times as wide, must be much greater, but, having no data on which to base an estimate, we will assume $18,675.82 as the average cost for the fifty-four dams.

PORTION OF LOUISVILLE AND PORTLAND CANAL, LOUISVILLE, KENTUCKY.

224,399 cubic yards of mud were dredged from the canal, only three miles long, in the year 1906.

The report of the Chief of Engineers gives the average cost of operation and care for the Louisville & Portland Canal for 1906, 1907, and 1908, as $106,496.66. Certainly this figure will not be any smaller with a larger canal and higher dams.

The report states that it was necessary to remove by dredging 224,399 cubic yards of mud from the canal, during the year 1906. This being the case, what are we to expect when the locks and dams are greatly enlarged?

What are we to expect as to the ten locks and dams to be placed below Louisville, in the portion of the river, much of which resembles

the Mississippi, in that it carries an immense load of silt rolling along the bottom of its bed? The Board of Review raised the original estimate of cost of operation and care by $200,000, on account of this condition, which is to be faced in the lower Ohio. The estimate seems wholly insufficient, but because of lack of definite knowledge, we will use the same figures for probable cost of dredging—we have therefore the following:

Interest charge of 4% per annum on $78,679,122	$3,147,164.88
Operation and care of fifty-four locks, etc., at $18,675.82 per annum	1,008,494.28
Annual operation and care, Louisville & Portland Canal..	106,496.66
Annual cost dredging in locks and above dams............	200,000.00
Total annual charge against traffic	$4,462,155.82

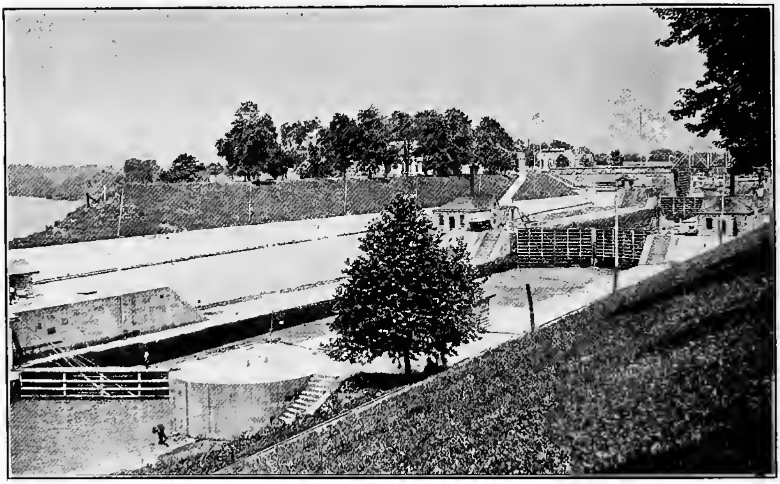
The special report of the Chief of Engineers, above referred to, gives commercial statistics for the Ohio, showing an aggregate tonnage of 13,165,656 tons for the year 1905. (One year later the total traffic is stated at 11,427,784 tons—for 1908 the showing will probably be much smaller.) It is explained, however, that this is far too high because it includes a great deal of duplication—the same tonnage being included in statements from two or more points. After a thorough consideration of the available data the Board of Review reached the conclusion that the actual total weight of freight was probably 9,350,000 tons. The report gives the distance that this tonnage was carried.

Computing the ton-mileage on this basis, we find that the total, for the whole river, for the year 1905 (the data on which the Board of Review based their statements), was 2,735,017,317, and this divided by the total tons carried gives an average distance of 292.52 miles. The total for the twelve months since the panic of October, 1907, will be far less. Major Sibert, of the U. S. A. Corps of Engineers (now a member of the Isthmian Commission) a distinguished engineer and a recognized authority on such matters, has made elaborate investigations and computations of the cost of moving coal on the Ohio River. The results of his investigations have been published in pamphlet form, and show that the cost of shipping coal in large quantities, on the **unimproved river**, from Pittsburg to Louisville (598 miles) is 45.8 cents per ton, or .076 cents per ton-mile. The cost below Louisville is slightly lower, but since we have no authoritative

data on which to base a calculation, we will assume that the coal from Pittsburg to Cairo is .076 cents per ton-mile, which gives a total of 73.3 cents as the cost per ton between Pittsburg and Cairo (965 miles).

Other elaborate computations, made by Major Sibert, show that the cost of similar river traffic between Pittsburg and Louisville, with the improvement completed so as to give a continuous nine-foot stage will be 24.1 cents per ton, or .04 cents per ton-mile.

Major Sibert further shows that, on a nine-foot permanent stage, coal may be shipped from Louisville to New Orleans for .039 cents per ton-mile, and this rate for the 367 miles between Louisville and Cairo



LOCKS IN LOUISVILLE AND PORTLAND CANAL, LOUISVILLE, KENTUCKY.

Maintenance and operation cost over $106,000 per annum. About 90 per cent of all commerce belongs to one great coal trust (Monongahela River Consolidated Coal and Coke Company).

would give a cost per ton of 14.3 cents—giving a total cost of 38.4 cents from Pittsburg to Cairo. This shows a saving of 34.9 cents per ton on coal shipments when made in quantities of 3,500,000 tons per annum—the shipper owning and operating the entire necessary plant —and when shipped a distance of 965 miles without breaking bulk. The rate, under such conditions, for the whole river, unimproved, is .076 cents per ton-mile, and for the river improved to a nine-foot stage will be slightly less than .04 cents per ton-mile. The cost then for the whole 2,735,017,317 ton-miles of the traffic of 1905, on the

unimproved river, if handled by one company, would have been $2,078,-613.16 and with the river improved to a nine-foot slack-water stage, the cost for the same tonnage will be $1,094,006.93, a saving of $984,606.23. The cost to the people of the Nation, per annum, of accomplishing this saving will be $4,462,155.82.

Verily, great is the waterways agitator in the role of political economist.

The total traffic of the Monongahela River Consolidated Coal & Coke Company, on the Ohio River, for the year 1905, was 1,914,418,887

LOUISVILLE AND PORTLAND CANAL.

Elevator taking coal from barges of the Monongahela Consolidated Coal and Coke Company at Fourteenth Street, Louisville, Ky.

Kentucky has two great coal fields, but Government favoritism enables the Pennsylvania combine to compete for the Louisville market.

ton-miles or 70 per cent of the whole traffic on the river. The proposed generous expenditure of the money of the people of the nation would save for that great monopoly $689,224.36 per annum, and 70 per cent of the expenditure of the public funds, or $3,121,509.07 would be the cost to the people of accomplishing that saving for the coal monopoly, which sells coal to citizens along the river at precisely the same prices at which the same quality of coal is sold when hauled by the railroads. The railroads receive no governmental assistance; pay immense sums for taxes, on their roadway and real estate, and are

cursed and abused by the demagogues and agitators, who are trying to rush the Nation into bond issues to obtain funds for the preposterous waterways schemes. Again: About 90 per cent of the total traffic on the Ohio River is coal, nearly all of which comes from Pennsylvania and West Virginia, and all of which is owned by a few coal corporations. Ninety per cent of the annual cost of the proposed system should therefore be chargeable against those corporations—$4,013,940.24 of the citizens' funds expended each year to save those corporations $886,145.61. The result will be of practically no benefit to the people, since the coal corporations will, of course, continue, as in the past, to sell coal at the highest price that is possible while continuing to hold the markets against the railroads. The actual cost to the people, with the improvement completed, with present volume of tonnage, will be .16 cents per ton-mile. The cost to the coal trust will be .04 cents—making a total of .20 cents per ton-mile, which is slightly higher than the rail rates on the Chesapeake & Ohio R. R.

The monstrous absurdity of all this is still more strongly emphasized when we realize that the coal territory, from which these corporations draw their supply must be exhausted in a very limited period, and that until it is exhausted, the people of the nation are assisting a few Pennsylvania and West Virginia coal corporations in an effort to exclude the owners and operators of coal territory in the vast fields of Ohio, Indiana, Kentucky, Tennessee, and Alabama from obtaining a reasonable profit in their home markets. An opposite policy would, of course, build up the coal shipping business of those states; give employment to great numbers of home people; increase taxable values and stimulate general business; thereby helping the merchants and manufacturers of the river cities by creating a home territory demand for their goods.

In the light of such revelations will the people agree with the ex-President in his assertion that "it is neither necessary nor desirable to postpone the beginning of the work until all the facts are obtained?"

But for the firm stand taken by the Speaker of the House of Representatives, we should probably have had a bill passed last winter committing the Nation to the prosecution of schemes more preposterous than any of those advocated by the charlatans and rascals who promoted the "Mississippi" and "South Sea" bubbles 200 years ago.

That there is no hope for a better showing in the future is evident since—

First. The packet boats will certainly be forced out of business as additional railroads are built closely paralleling the river.

Second. The coal territory, which will make a large traffic possible for a while, must be exhausted, within a very limited period. The reduction of the supply and the increased consumption, for coke and other uses, in the Pittsburg District, will probably sharply reduce the river shipments from the territory above that city within a decade —long before the canalization of Ohio River can be completed.

Third. The Engineers of the Board of Review state, "It is believed that as much coal is now shipped by water as there is a demand for on the lower rivers." The present demand for "river coal" will probably be sharply reduced when the railroads have completed certain radical improvements that will enable them to haul coal from Western Kentucky, Illinois, and Alabama to New Orleans and other river cities, at greatly reduced cost. It is probable that the railroads will be able to place Alabama coal at the doors of New Orleans factories at a cost, for transportation, of less than half the cost of the transportation by water from Pennsylvania and West Virginia, even though all Government expenditures be omitted from the reckoning. The Illinois Central Railroad is now hauling coal from Illinois and Western Kentucky to Memphis at such low cost that the "river coal," from Pennsylvania, has been almost forced out of that market.

Anderson's report for the year 1907 showed that 591,000 tons of coal were brought into Memphis by rail, and only 50,000 tons by river.

Fourth. As the railroads reduce their grades, eliminate curvature, improve their roadways with ballast and heavier rails, and install more powerful locomotives and cars of greater capacity, they will be able to deliver coal from the coal fields near the river cities, to those markets cheaper than the boats can bring it the longer distance, in spite of the Government favoritism towards the water route.

Coal is now shipped over the Chesapeake & Ohio Railroad from the Kanawha coal fields via Cincinnati (236 miles) to Cleveland at a rate of .185 cents per ton-mile, or a total cost of forty-four cents per ton. The distance from the Kanawha coal field to Cincinnati by the water route is 277 miles. The cost on the canalized Kanawha is .54 cents per ton-mile (seventy-three miles) and on the Ohio, when canalized, the cost will be .20 cents per ton-mile (204 miles). The total cost, therefore, by water will be 80.22 cents per ton, whilst by rail it is forty-four cents.

Since, however, the people of the Nation at large will, when the Ohio River improvement is completed, assist the corporations that ship by water to the extent of 51.6 cents per ton, and leave them to bear only 28.62 cents per ton of the cost of transportation (though they contribute to the support of the Government nothing that is analagous to the immense sums that the railroads pay in taxes on their road-bed, right of way, terminals, etc.) the rail route may not be able always to compete successfully with the water route. Nevertheless, so great are the inconveniences, dangers, and delays of water transportation, and so poor are the facilities provided by the boats for delivering their freight, that in spite of the fact that the people of the nation even now, whilst this portion of the Ohio River is unimproved, are paying over half as much to assist the water shipments between the Kanawha coal fields and Cincinnati, as the total cost of rail shipment between the same points (and will eventually actually pay more than the total railroad cost between the same points), yet the rail line does still transport immense quantities of coal from the Kanawha fields to Cincinnati at rates much higher than its through (Cleveland) rates, above mentioned. It is highly probable that the railroads will always handle a large portion of this tonnage, in spite of the preposterous Government favoritism exhibited towards water routes, because the rail line is certain and swift, and can deliver the coal at the precise point at which it is needed.

Coal is now shipped from Eastern Kentucky, across a rough hill and mountain region, over steep grades, a distance of over 200 miles, to Louisville by rail, and retailed for domestic purposes at the same price ($4.15 per ton) as that demanded for the coal that the Government helps the Monongahela River Consolidated Coal & Coke Company to transport from Pittsburg to Louisville by river.

Coal is now shipped over the Illinois Central Railroad from Western Kentucky to New Orleans (712) miles for $1.50 per ton, or at .21 cents per ton-mile.

At New Orleans this coal comes into competition with the "river" coal (belonging to the Pittsburg trust) which has been floated down the Monongahela (sixty-four miles), Ohio (965 miles), and the Mississippi (966 miles); a total distance of 1,995 miles. The cost of moving a ton of coal along one-half of the length of the improved portion of the Monongahela River is 19.20 cents, of which the people of the Nation pay 7.68 cents, and the coal monopoly pays 11.52 cents. The cost of moving a ton of coal along the Ohio River, when improved to

nine-foot depth will be $1.93, of which the people of the Nation at large will pay $1.55 and the coal trust thirty-eight cents. The cost, to the people of the Nation of moving coal down the Mississippi River from Cairo to New Orleans cannot be stated with certainty. We know, however, that the total commerce on this portion of the Mississippi River in 1906 was 1,556,420,117 ton-miles, of which 853,291,070 ton-miles was coal and coke from the Ohio River —almost all of it being the property of the Pittsburg trust. We know also that the National Government is now expending or attempting to expend $2,000,000.00 per annum in addition to ordinary appropriations, on the "improvement" of the Mississippi River below Cairo— the "improvement" for navigation being the maintenance of a nine (9) foot channel by means of hydraulic dredges, and that the usual explanation and apology for this work are that the tonnage of coal and coke from the Ohio River, borne in barges requiring a nine-foot depth, justifies the cost of maintaining a nine-foot channel.

The cost, to the coal trust, for moving a ton of coal from the Monongahela field, via the rivers, to New Orleans (1,995 miles), will be 93.1 cents. In addition to this there will be a cost to the people of the Nation of $1.63 per ton for the portion of the distance that extends from the coal fields to Cairo. Furthermore, there is a cost now paid by the people, of $2,000,000 per annum in addition to ordinary appropriations for improving the Mississippi below Cairo, where fifty-five per cent of the whole commerce belongs to the same coal trust (fifty-five per cent of $2,000,000 is $1,100,000, but we cannot use this figure because a portion of the Mississippi River appropriations are expended on levee construction). It will, therefore, cost the people of the Nation thirteen cents more, per ton, to assist the coal trust in transporting coal from Pennsylvania to Cairo, en route to the lower Mississippi ports, than the Illinois Central Railroad charges for transporting coal 712 miles, from Western Kentucky to New Orleans, and the Government is spending immense additional sums to further assist the monopoly in forwarding this same coal on down the Mississippi River to New Orleans.

The astounding absurdity of all this makes the proposition seem almost incredible. The ridiculous nature of the scheme is still further emphasized when we remember that coal is now being shipped from the Alabama fields to New Orleans (418 miles), via the Louisville & Nashville Railroad, for $1.25 per ton, and "run of mine" coal, in carload lots, is actually being sold in New Orleans at $2.75 per ton.

This is less than the sum the "statesmen," including our strenuous ex-President, wish to have the people of the Nation contribute towards assisting the Pittsburg monopoly in transporting coal from the limited Pennsylvania coal field, to New Orleans.

We have seen that our statesmen propose to tax the people of the Nation to the extent of $1.63 per ton, in order to assist the monopoly in transporting coal from Pennsylvania as far as Cairo. It is astounding to find that coal (run of mine) from the Illinois field is actually now sold outright, in Cairo at $1.45 per ton. The "statesmen" propose also to assist the monopoly, with money collected from the people, in further transporting this same coal to Memphis (probably at about fifty cents additional cost per ton). Coal from the Illinois coal fields is now sold in Memphis, in carload lots, at $1.90 per ton. It were far less costly for the Government to buy the coal from the Alabama, Illinois, and Western Kentucky fields, give it to the people in Cairo, Memphis, Vicksburg, Natchez, and New Orleans, and pension the members of the Pittsburg trust.

We find, then, that the proposed expenditure on the Ohio River improvement means a tax on the people of the whole Nation, in order to assist a Pennsylvania monopoly in "carrying coals to New Castle;" that if this preposterous waste be not stopped, the citizens of the whole Nation will be taxed through the Internal Revenue and Import Duties, to assist the Monongahela River Consolidated Coal & Coke Company in shipping fuel from the cold North to the "Sunny South," when less fuel is needed there than anywhere else, and when there are already vast quantities of coal in that territory that may be purchased outright at a cost smaller than the sum that the "statesmen" propose to have the people contribute towards the cost of transportation from Pennsylvania.

Charles Dickens, with a keen sense of humor and quick perception of the ludicrous, could conceive of nothing more laughable than good Mrs. Jelleby wholly neglecting her household affairs in order to devote her energies to promoting schemes for providing red flannel undershirts for "the natives of Borrio-boola-Gha, on the left bank of the Niger." Our last Chief Executive and his admirers were advocating and actually putting into effect a "waterway scheme" more ludicrous than anything that Dickens could originate.

The folly of the proposed expenditure of $63,731,488 on the Ohio River, in addition to the great sums already expended, is still further emphasized by the fact that the managers and owners of the pampered

Pennsylvania and West Virginia coal industries assert that they would rather have the river as it is, than have fixed dams erected that would prevent their floating their product to market on the open river, during the smaller rises. The dams being erected, are movable and are thrown down when not needed to give a nine-foot stage of water. It is seen then that the result of this vast expenditure will not be utilized, during flood periods, since the loaded coal vessels are most economically handled if floated down stream, in high water, when locks and dams are not needed, and probably seventy-five per cent of the coal that will be shipped down the Ohio will go on the river when it is at high stage, and will not utilize the locks and dams. The locks and dams will, of course, enable the coal vessels to move at all seasons and will afford deep and still waters, to facilitate the return of empty barges, but four or five feet of water would be sufficient for the empty barges and for the Ohio River packet boats. The packet boat traffic amounts to very little now (eight per cent to ten per cent of the whole traffic) and will, except for pleasure boats, almost certainly decrease and cease altogether, when railroads have been built closely paralleling the river on both sides. One packet boat line between Memphis and Red River, one line between Evansville and Louisville, and one between Pittsburg and Cincinnati have been thrown into the hands of receivers within the past eighteen months, though only a small portion of the river has yet been paralleled closely by railroads.

The intelligent citizens of towns along the river, wholly dependent upon primitive river transportation, with its high cost and miserably poor service, are eager to secure railroads, because such towns, being thus hampered, ceased to grow many years ago. It seems certain that when the limited coal area in Pennsylvania and West Virginia, now tributary to river transportation, on the Ohio, is exhausted, the locks and dams that shall have been constructed will be practically useless, and not worth maintaining; and that the whole Ohio River canalization improvement will be but another monument to the folly of men who allow themselves to be governed by prejudice, or misled and duped by demagogues and political agitators.

The locks and dams along the James River in Virginia were long since abandoned, and similar works, on which immense sums of money have been wasted, have been abandoned in other parts of the country. A large share of the State debt of Virginia, under which she has been

groaning for half a century, was incurred in building the Old James River and Kanawha Canal.

It seems then that there is no room for comparison between traffic on the Ohio River and that on the Mississippi and other rivers, and that the traffic on the Ohio is temporary, more costly than railroad traffic, and only rendered profitable to a few coal corporations under the most favorable imaginable conditions, by an unjust and extravagant favoritism, which is a disgrace to the legislative and executive departments of our Government.

Lake Erie and Ohio River Canal.

The waterways agitators are trying to lead the public to believe that there is some likelihood of water transportation between the Great Lakes, which are navigated by vessels drawing twenty feet, and the Gulf of Mexico, which is navigated by vessels drawing twenty to thirty feet, by way of a twelve foot canal (estimated to cost about $30,000,000) from Lake Erie to Beaver on the Ohio River, thence down the nine-foot (proposed) Ohio to the Mississippi, and thence down the fourteen-foot (proposed) Mississippi to New Orleans, and thence to foreign ports in vessels drawing from twenty to thirty feet of water. This would necessitate breaking bulk and transferring freight four times, if transfer be made from boat to boat, or eight times if transfer be made from boat to wharf and then to another boat, besides encountering all the difficulties and dangers of the Ohio and Mississippi Rivers for 2,000 miles after a canal trip of about 100 miles, from Lake Erie to the Ohio River at Beaver. It might be amusing to speculate as to how many-fold more costly this would be than rail transportation (the Illinois Central Railroad is only 923 miles long from Chicago to New Orleans) were there any likelihood of a single ton of freight ever making the 2,100 mile journey with freight handled four to eight times, when the rail distance, via Pittsburg to New Orleans is only 1,212 miles. But it is useless to entertain this "iridescent dream" because there are difficulties about building the "Lake Erie and Ohio River Canal." For instance: There is a high summit between the lake and the river, with practically no water available. If a canal should be built with timber gates to the locks they would be in danger of destruction by fire caused by sparks from passing railroad locomotives. Even Gulliver himself, would be unable to extinguish the flames, under such conditions.

Chapter XIII.

COMPARISONS BETWEEN RAILROAD AND WATER RATES.

"In 1862, gold was discovered in Montana. * * * * The Missouri River was the only means of transportation. * * * * The usual rate charged on freight was from ten to fifteen cents per pound (from $200 to $300 per ton) and a first class passage (from St. Louis) to Fort Benton cost $300.00."—Lawrence M. Jones, Prest. Mo. Valley Impv. Assn.

A large number of misleading statements are current, which appear to have been prepared, with a view to exciting prejudice against the railroads, wherein it is alleged that rail rates are lower, between points having both rail and water communication, than between points having only rail lines of transportation. It is true that deep-water commerce on the Great Lakes and on the open sea may be made much less costly, mile for mile, than railway transportation on land. On such waters single vessels bear freight burdens of from 10,000 to 25,000 tons. Safe harbors, with waters from twenty to forty-five feet deep have been provided or improved, and are being maintained at the expense of the people of the Nation. Every known modern device for cheapening and expediting loading and unloading is at hand. Wharves, docks and slips have been constructed and are maintained by the nation or by local communities. Railroad tracks, permanent and safe, place cars alongside the ships, so that interchange of freight between the modern sea and land carriers of heavy tonnage, may be quickly and economically effected.

Between two such sea-ports, if both be accessible to the same railroad lines, the water transportation is the less costly. Hence immense burdens of low grade freight—coal, iron ore, and grain—are floated, back and forth between the lake ports, in ships owned and operated by the railroad companies, at very low cost. The actual cost on the lakes is about eight-tenths of a mill, per ton-mile, not including the expense borne by the people of the nation or of the lake port cities, for building and maintaining the harbors and connecting channels, on which no taxes are assessed and no tolls collected.

This is a little less than half the cost of coal shipments, in train-load lots, on the Chesapeake & Ohio Railroad.

The railroad rate-makers must include in their reckonings interest on all investments—both terminals and roadway—as well as all costs for maintenance of way and actual operation. They must not forget that they will have to pay exorbitant taxes on all their properties and provide great sums of money to defend themselves against the innumerable dishonest and fraudulent personal-damage claims with which they are perpetually besieged, by pettifogging lawyers, in every village, town, and city along their lines. They must also take into account the fact that State and National Railroad Commissions have been appointed, with power to perpetually harass them and interfere with every phase of their operations, and that State Legislatures are almost constantly in session, somewhere, the members of which are amusing themselves, and entertaining their home constituencies by enacting freak laws for railroad "regulation"—the sole effect of which is to increase expenses and reduce revenues.

Under such combinations of conditions, it is impossible for the railroads to haul freight on land at as low cost as it may be borne on the lakes and on the ocean, and railroad lines paralleling such waters must meet the water rates or surrender their business, and consequently, railroads, so situated, operate lines of ships on the lakes, and on the sea.

Where such conditions prevail, it is doubtless true that some rail lines are forced to haul certain classes of tonnage on land at, or below, cost, because, where trains must be kept going, it is better to haul **some** tonnage at a small loss, than to haul trains **empty** at a total loss. Acting on the same principle, sea-going vessels often accept burdens at rates far below their regular tariffs, and, sometimes, actually below the cost of transportation, rather than return to their home ports empty.

Our waterways agitators seize upon such isolated instances and unusual conditions of rate-making and herald them abroad, without explaining the peculiar local causes; and great multitudes of honest and upright citizens are deceived thereby, and embittered against the railroads.

There are innumerable other modifying conditions that affect actual costs of transportation, and resulting tariff rates, to which the agitators do not call attention, and of which they are probably ignorant. The "Preliminary Report of the (Roosevelt) Inland Waterways

Commission" (Senate Doc. No. 325, 60th Congress, 1st Session) contains much of this species of sophistry and balderdash, by means of which an effort is made to sustain the contention that immense expenditure on inland rivers and canals, is justifiable, even though the resulting waterways be never used. Agitators reason about as follows: "Commerce on the Mississippi, and many other rivers, has practically ceased, yet the tariff charges of the railroads that have been built along the valleys, parallel with the rivers, are lower than on railroads built across country; Ergo, the mere existence of the unused waterway reduces the railroad tariffs. If we spend millions to deepen the rivers, we shall probably save hundreds by further reducing the rail rates." That this is mere puerile nonsense is easily proven.

Railroads built along valleys and parallel with water courses may, usually, be made almost level, at low cost for construction, and such lines are also maintained and operated at low cost.

Railroads crossing hilly or mountainous country must be built with steep grades and sharp curves. Their construction requires immense capital investments in tunnels, piercing the mountain ridges, in great viaducts and bridges crossing deep valleys and canyons, in solid rock excavations along the faces of perpendicular or overhanging cliffs, in removing huge masses of sliding materials that rush down the mountain sides and cover up the work that has been begun or completed. The maintenance and operation of such lines is also very costly, and is a perpetual drain upon the resources of the roads.

The same engine that can haul a train, weighing 2,700 tons alongside a river, with maximum .3 per cent grades, can haul only 800 tons across country, on a road having grades as steep as 1.5 per cent. It is usually easy to build along the rivers with 0.3 per cent grades; whilst 1.5 per cent grades are about the average used, across country, throughout the South and West. It costs nearly as much for operating expenses alone to move 800 tons across country as it does to move 2,700 tons alongside a river. Again, the cost of grading a road-bed alongside a water course will always be much less than that across country, and consequently the fixed charges, to be met each year, will be far less in the first case than in the second. The first cost of a large part of the South and Western Railroad (now the Carolina, Clinchfield and Ohio Railway) through the mountains of Kentucky, Tennessee and North Carolina, being built for coal traffic between the mountains and the seaboard, is averaging (I am authoritatively

informed) about $200,000 per mile. One per cent grades are being used, opposed to northbound trains, and .5 per cent grades opposed to southbound trains. A nearly level, first-class railroad line might be built along the Ohio River from Louisville to Cincinnati, at a cost of about $30,000 per mile, over which a given engine could pull double as much as the same engine could pull over the South & Western Railroad. The cost of 130 miles, along the river bottoms, would be $3,900,000, and the interest charges per annum, at four per cent, would be $156,000. The cost of 130 miles of the South and Western would be $26,000,000, and the annual interest charges, at four per cent would be $1,040,000. Manifestly, the road along the river could make a handsome profit on freight at rates at which it would be impossible for the mountain line to pay expenses.

It is evident, therefore, that comparisons between tariffs on railroads competing with water courses, and the tariffs on lines extending across country, are wholly unjust and misleading. Yet, from such absurd data, the demagogues and agitators have advanced their chief argument in favor of looting the national treasury to improve the rivers and build canals; viz., that such expenditures must reduce railroad rates, even though the rivers and canals be never used, because railroad rates are now lower, along water courses, than elsewhere.

The report calls attention to the fact that rail rates between New York and Buffalo, which cities have both rail and inland water communication, are 6.0 mills per ton-mile for sixth class freight; whilst the rate on the same class of commodities from New York to Pittsburg, with only rail communication, is 6.8 mills per ton-mile. They fail, however, to call attention to the fact that in the first instance the freight is hauled over a practically level roadbed, paralleling the Hudson River and Erie Canal, whilst in the second instance it is hauled over the Allegheny Mountains, on a roadbed, the construction of which has required a stupendous capital investment.

They call attention to the fact that the rail rate on coal from the Kanawha coal field to Covington, Ky., 248 miles alongside a river, is 3.6 mills per ton-mile, whilst the rate to Lexington, Ky., 228 miles, with only rail communication, is 5.3 mills. But they do not note that, in the first instance the coal is hauled a longer distance in immense quantities, down the Kanawha and Ohio Rivers; whilst, in the second instance, it is hauled a shorter distance in comparatively small quantities, over a rough roadbed, with steep grades, to a town located

on top of a high plateau, in the beautiful blue grass region of Eastern Kentucky.

That inferences drawn from comparisons made between tariffs of transportation lines, operating under dissimilar conditions, are necessarily erroneous, may be illustrated by a comparison which will "prove" that water competition causes railroads to increase their rates.

The Louisville & Nashville system gives a rate on coal from Livingston, Kentucky, to Atlanta, Georgia, across a rough, mountainous country, of 2.65 mills per ton-mile. This line is over a hundred miles from any competing navigable water course, and passes through or alongside of the Appalachian Mountains, having both of its terminals high up in the hill country.

The Louisville, Henderson & St. Louis Railroad extends from Louisville, on the Ohio River, to Henderson, on the same stream, and is within sight of the river bank for over three-fourths of the distance between the two cities. The rate on coal on this road is 3.70 mills per ton-mile.

Does water competition tend to increase railroad rates? Of course not. The difference is due to divergent conditions as to rate of grade, volume of traffic, etc., and the existence or non-existence of the dusty bed of the Ohio River has very little to do with the matter in this instance, though down-stream coal traffic on the Ohio, for a part of each year, is (government contributions not considered) surprisingly inexpensive.

An immense amount of nonsense has been foisted upon the public, intended as arguments for issuing bonds for waterways construction, on the allegation that the existence of the waterways, even if never used, will tend to lower railroad rates.

Let us consider some actual facts bearing upon this preposterous contention—now the chief stock argument of the waterways advocates.

The members of the ridiculous (Roosevelt) "Inland Waterways Commission," Mr. Roosevelt himself, and great numbers of his silly satellites and imitators, have used this argument, and agents were even sent to Europe, at the public expense, hunting for data to uphold the idiotic contention. The "Preliminary Report" of that "Commission" is now in print, and furnishes more data, flatly contradictory of the contentions of its authors, than any other single volume yet printed in the English language.

The following data and historical facts, taken from that report, are strangely out of accord with the contentions of its authors. (Senate Doc. No. 325, 60th Congress. 1st Session):

(1) In 1870, when the Erie Canal was an active competitor for freight, the railroad rate on corn from Chicago to New York was 24.37 cents per bushel; in 1906, when the canal had long ceased to be a competitor worthy of consideration, the rail rate on corn, between the same cities, was 9.52 cents per bushel.

(2) In 1879, when there were many great steamboats plying on the Mississippi River, and when a large freight traffic was still being borne on its waters, the rail rate on wheat and other grain, from St. Louis to New Orleans, was 21 1-2 cents per 100 pounds; in 1907, when there were no boats running through from St. Louis to New Orleans, and when the river tonnage, out of St. Louis, had almost disappeared, the rail rate on wheat between those cities was seventeen cents for wheat and fifteen cents for other grain.

Scores of similar facts are brought to light by the report, but why should one attempt to seriously consider the contention of such impossible and irrational persons—as well attempt to argue with Mr. Ransdell, the chief of these boomers, about the probable cost of "importing a number of large jackasses from Spain," by means of automobiles.

Chapter XIV.

SECRETARY KNOX'S PITTSBURG ADDRESS.

"The shoemaker should stick to his last."—Old Proverb.

Ex-Senator Knox, of Pennsylvania, now our honored Secretary of State, is one of the leading lawyers of America. It cannot be doubted that he is also a statesman of great ability, but it would seem that he is not very well prepared to discuss navigation, transportation, or engineering problems. In view of his total unpreparedness to discuss such questions, one is surprised that he too was not made a member of the Roosevelt "Inland Waterways Commission"—he would have found eight most congenial and sympathetic associates among the members of that curious body.

Before passing from the subject of Ohio River improvement, it seems meet that we should consider, as briefly as possible, an address delivered by the learned senator at a banquet of the Chamber of Commerce of Pittsburg, on February 12, 1908. His ideas and arguments, at that time, may have been, in some subtle manner, affected by the distraction from which one must suffer who has a "bee in his bonnet." Inland waterways had then become extremely popular, because of the generally current teaching that therein was to be found a talisman that would cure all the ills that transportation is heir to, whilst at the same time producing meat and drink for all mankind.

The Senator said in the course of his address, "The stage has been reached when local jealousies should be cast aside and these limited and partial views enlarged to the perception that whatever expenditure is necessary to bring to its utmost economic capacity—every river able to furnish a route for industrial or agricultural products and material, is the most remunerative investment that can be made with national funds." Pardon a slang phrase, but really "that's goin' some." It would seem to include every river in the national domain —the Yukon as well as the Salt, and every one of them will prove

"the most remunerative investment," etc., etc.—difficult to understand that, but let us pass on.

He next states that "The duty of the Government to improve its waterways and harbors is made exigent by the great expenditure in progress on the Isthmus of Panama." That is to say, that since we are expending about five hundred millions of dollars on an experiment, which is, economically, of a most doubtful character, we should hasten to expend many additional billions on other schemes that would certainly be failures, whether the first experiment succeeds or not—rather questionable logic one would think.

Again, he says, "When the Government assumed charge and control of the navigable streams of the interior it entered into a practical contract with the states and communities bordering these streams that their waterways should be improved to their highest capacity." Woe worth the day, if this contract can be enforced, but since there were no **"states"** in the Mississippi basin and the members of the **communities** then living on the borders of its rivers, have long since passed to the "happy hunting grounds," perhaps there is no one who can enforce performance of the suicidal pact. In any event, it is a principle of law that agreements to commit murder or suicide are non-enforceable.

The Senator said, "Nothing is more wasteful or more eloquent of bad business management than partly finished buildings, railroads or waterways left useless and falling into decay." There seems much truth in this, but we can suggest one thing that would seem far more "eloquent of bad business management"—that is the building of other similar works under precisely the same conditions that caused the first ones to be "left useless and falling into decay." The original blunder indicated **bad judgment,** the repetition would be "eloquent of" **total idiocy.**

He says, again, "That modern and improved water routes furnish the cheapest transportation for large masses of fundamental freights on which the time consumed in movement is not vital, is clearly demonstrated by the vast cargoes of ore, coal and grain traversing our lakes and the great tows of coal going down the Ohio and Mississippi Rivers whenever the stage of water attains a depth of nine to twelve feet."

That modern inventive genius has not been able to produce a rail locomotive that can swim on the lakes or on the ocean, is true, and that railroads cannot compete successfully with the leviathans of the

great deep, in their native element, must be admitted, but the Senator wholly begs the question in applying his dictum to the "improved rivers" which he includes in this remark. Indeed, quite the reverse has already been demonstrated as to every improved river in the United States that has not been given a depth of at least twenty feet, and as to some that require no improvement and have a natural depth of forty feet or more—the lower Mississippi, for instance, between New Orleans and Baton Rouge. If he had applied his dictum to the **unimproved** rivers, i. e., the ones in which there is no capital invested calling for interest, and where there are no expenses for operation and care, a few examples might be found, where, for a brief period each year, his claim is sustained by the facts. The rarity of such instances is due to the absence of "large masses of fundamental freights" along the banks of most of our rivers, or else to the absence of demand for such "fundamental freights" along the banks of the same waterways.

The Senator also makes use of the common stock sophistries that have recently become so hackneyed, and with which we have dealt in previous pages. They are tantamount to arguing that, since the Brooklyn Bridge has proven a success, therefore it is reasonable to expect a Key West-to-Havana bridge to succeed also. We refer to the conclusion that navigation of canals and improved rivers must prove a success because navigation on the Great Lakes and their connecting channels is a success; and that canals and waterways should succeed in America because unwise laws have been enforced in Europe that compel shippers to use the primitive and antiquated canals and waterways, instead of modern railroads, such as we have in this country. Professor Hugo Meyer says, in this connection:

"The countries of Europe have, therefore, inflicted upon themselves immeasurable harm, by pursuing a policy which has reduced their railways to mere feeders to the waterways and has prevented them from becoming modern and efficient means of transportation."

Hence such arguments and conclusions as are made and reached by the Senator are puerile and wholly unworthy of a great lawyer and statesman, even though he be temporarily bothered by the siren song of a "bee in his bonnet," luring him towards the White House.

The Senator did, however, add something new to the gayety of the general discussion by going into a detailed argument to prove—

First. That cities on the Great Lakes have grown faster than those on the rivers.

Second. That cities on the canalized Monongahela River have grown faster than those on the unimproved Allegheny.

First. It seems probable that there is no rational man who will, for a moment, question the truth of the first statement, or doubt that the reason for the very notable difference is that the lake cities have access to deep water navigation where good natural or inexpensive artificial harbors make possible and economical the construction and use of every known device for cheapening and expediting the transfer of freight from land to water transports, and vice versa, whilst the river towns are so situated that economical water transportation, on a large scale, is rendered forever impracticable by the laws of nature. The truth of all this is specially emphasized by the fact that the immense traffic on the lakes has grown up with no expenditure by the Government beyond the improvement of some harbors and a comparatively insignificant expenditure to deepen the short connecting channels, whilst there has been expended on the rivers over $360,000,000, with the result, as stated by Mr. Roosevelt, that, "In spite of large appropriations for their improvement, our rivers are less serviceable for interstate commerce to-day than they were half a century ago, and in spite of the vast increase in our population and commerce they are, on the whole, less used." All of which is but a statement of a condition which all the theories of speculators, scientists, and agitators cannot modify. There is no hope, until further scientific discoveries are made, of any relief, except in building railroads, with double, triple or quadruple tracks, with grades as nearly level, alignment as nearly straight, roadbeds as nearly perfect, locomotives as powerful and cars as capacious as they can be made; and to that task and its encouragement the whole body of citizens and Government officials should address themselves with energy and persistence.

Second. The comparison between the Allegheny and Monongahela Rivers.

We wonder whether Secretary Knox even went up the Monongahela River all the way from Pittsburg to Fairmont. Surely not, or he would not have stultified himself by calling attention to conditions that utterly defeat his reasoning and capsize the boat in which he placed his fish. He goes into an elaborate argument, based on the allegation

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that the growth of towns along the Monongahela River, which is canalized, has been far more rapid than the growth of towns along the Allegheny, which is not canalized, and concludes that the alleged difference in rate of growth has been due solely to the construction of locks and dams in the Monongahela.

This is positively funny.

Naturally, the first question that arises is, why was the Monongahela, which is the smaller stream, canalized, whilst the Allegheny was left in an impassable condition? The answer is that though both streams penetrate coal territory, the Monongahela, for nearly its entire length, cuts through the field of coking coal, which was first developed at Connellsville and has become world-famous, whilst the Allegheny cuts through a totally different field.

Pittsburg long ago became one of the greatest iron and steel smelting and manufacturing centers on earth, and, consequently, consumes a tremendous quantity of coke. The level space in the river bottoms at the confluence of the Allegheny and Monongahela is very limited and was soon congested. Great factories and furnaces consume immense quantities of water for power and other uses, and both building and operation on level ground are far more economical than on steep hill sides. The hills along the Allegheny and Monongahela are precipitous and the bottoms narrow, hence, the industrial and manufacturing districts have been extended along the Monongahela, where there is a good deal of level ground, clear up to the mouth of the Youghiogheny, fifteen miles, and along the Allegheny, where there is but little level ground, up to Aspinwall, about eight miles. All this is practically one city, though portions of it are still called by the old names of "Braddock," "Rankin," "Duquesne," "McKeesport," "Homestead," just as portions of New York City are still called "Harlem," "The Bronx," "Manhattan," "Brooklyn," etc. To attribute the growth of any one of these portions of the city solely to the improvement of the Monongahela River is as preposterous as it would be to attribute the growth of Manhattan, Harlem, or Brooklyn solely to the improvement of the Hudson.

Why have the towns along the canalized Monongahela grown much faster than the towns along the unimproved Allegheny? We must answer in true Hibernian style—because they have not done anything of the kind. If we eliminate from the comparison, the portions of the city of Pittsburg above mentioned, and compare the towns, along the 112 miles of the canalized Monongahela, above the mouth of

the Youghiogheny, which are Elizabeth, Monongahela, Belle Vernon, California, Fayette City, Brownsville, Monessen, Charleroi and the Morgantown and Fairmont districts with the towns along the 180 miles of the unimproved Allegheny, above Aspinwall, which are Parnassus, Freeport, Kittanning, Brady's Bend, East Brady, Parker, Emlenton, Franklin, Oil City, Tidoute, Warren, New Kensington, Creighton, Natrona and Arnold, we find that there was, in the first case, an aggregate of 13,085 population in 1870, and 44,674 in 1900, whilst in the latter there was an aggregate of 18,781 in 1870, and 56,789 in 1900 The increase in the Monongahela district was 2 2-5 of the original, whilst that of the Allegheny towns was 2 1-50, showing little difference. The whole of the portion of the Monongahela River, along which the towns mentioned are situated, has been canalized at immense cost, whilst along the portion of the Allegheny that we refer to, there has been practically no canalization.

Why is it that the growth of towns along the canalized Monongahela, which penetrates the Connellsville coking coal district for 112 miles, has **not** been much more rapid than the growth of towns along the unimproved Allegheny from Sharpsburg to Warren, 180 miles? One would naturally expect to find a vastly more rapid growth of population in the district from which hundreds of millions of tons of soft coal have been mined and converted into coke by thousands of great ovens, than in the district from which a comparatively small quantity of coal has been taken for domestic uses. What has checked the growth of the Monongahela River towns?

The answer is not far to seek—the Pennsylvania Railroad has a nearly level "through" rail line extending along the entire length of the Allegheny, from Pittsburg to Warren, and thence northward, whilst the Pennsylvania line along the Monongahela is only a spur extending up to Brownsville, fifty-five miles. There is no "through" rail line following the Monongahela River.

The absurdity of Mr. Knox's contention is emphasized when we consider—

First. The canalized portion of the Monongahela River is 138 miles long. The Pennsylvania Railroad and the Pittsburg and Lake Erie Railroad have spur lines extending along the opposite banks of the river up to Brownsville fifty-five miles. Until quite recently there was no rail line along the river on either side, above Brownsville, for a long distance, but the canalized river extended on up to Fairmont, eighty-three miles above Brownsville. Eleven of the Mo-

nongahela River towns, cited by Senator Knox are on one or the other of the two railroads mentioned, on the fifty-five mile reach; only two are on the eighty-three mile reach of the canalized river above the ends of the railroad spurs mentioned. These two, Morgantown and Fairmont, are on the Baltimore & Ohio Railroad, which enters the valley at Point Marion, and neither of them ships a ton of coal by water. Lock number ten is at Morgantown; lock number fifteen is at Fairmont. There are many mines along the river between the two towns, the output of which is shipped by rail; but the aggregate tonnage of coal passing through the six locks during the year 1906 was just one-tenth of one per cent of the whole river shipment on the Monongahela. Every ton of coal so shipped cost 21.4 cents per ton-mile. We have, then, this amusing situation. Along eighty-three miles of the canalized Monongahela the total urban population in 1900 was only 20,472 in the three towns, Point Marion, Morgantown, and Fairmont, all on the Baltimore & Ohio Railroad, no one of which towns ships a ton of coal by water, though all three are in the heart of districts that are shipping immense quantities of coal and coke by rail.

Second. Dam number nine is at Point Marion; number fifteen is at Fairmont. There are only two small mines between them that ship by water, and their total shipment by water was less than one-fifth of one per cent of the total coal shipment on the whole river, during the year ending June 30, 1907—the era of the greatest prosperity that America has ever known.

Secretary Knox attributed the growth of two of these towns, situated in the midst of coal mining districts that ship almost exclusively by rail, to the canalization of the river. Why, we repeat, did not Mr. Roosevelt make him a member of the Inland Waterways Commission? His methods of reasoning, about engineering and transportation problems, fit him pre-eminently for true and laudable service with that remarkable aggregation.

All of this goes to show how hard it is to prove that white is black, or to prove that antiquated water transportation is better or cheaper than modern rail carriage on land.

Let us attempt to apply the great statesman's logic, by way of illustration. The Pennsylvania Railroad extends through the Pennsylvania coking-coal district, about parallel with the Monongahela River, but a great many miles from it. Along the Pennsylvania Railroad, within a distance of about fifty-five miles there are the fol-

lowing mentioned towns: Blairsville, Latrobe, Greensburg, Mount Pleasant, Scottdale, Everston, Connellsville and Uniontown—the aggregate population in 1870 was about 7,660—the aggregate population in 1900 was 42,317.

Along the canalized Monongahela River between Brownsville and Fairmont, eighty-three miles, are Brownsville, Point Marion, Morgantown and Fairmont. The aggregate population in 1870 was 4,017, and in 1900 it was 10,419. The increase along the railroad has been 452 per cent whilst along the canalized river, where each of the towns mentioned has also a railroad and is in the same coal district, the increase has been only 160 per cent.

Ergo: The canalization of the river has **prevented** the towns from growing.

We refer this brilliant syllogism to the waterways agitators.

Chapter XV.

LAKES-TO-THE-GULF DEEP WATERWAY, AGAIN (CHICAGO TO ST. LOUIS.)

"Fourteen feet through the Valley!"—The Boomers.

The deep waterway proposition that is now attracting the greatest amount of attention, and that is supposed to be the most important in America, is the "Lakes-to-the-Gulf," or the "Fourteen feet through the valley," about which so much has been published in the magazines and newspapers, during the past few years. It was in this connection that Mr. Roosevelt said: "The Mississippi should be made a loop of the sea," and "Deep channels * * * * from the Gulf to the Great Lakes will have high value for the national defense." We introduced this subject in our eighth chapter, and mentioned its general divisions, but it seemed logical to discuss many matters affecting general waterway conditions, and also to consider questions connected with traffic on the Ohio River and its tributaries, before proceeding with a discussion of the local difficulties that make the "Lakes-to-the-Gulf Deep Water" wholly impracticable.

Three considerations led to the adoption of this arrangement:

First. A very large share of all the traffic on the Lower Mississippi River originates on the headwaters of the Ohio—chiefly along the Monongahela River above Pittsburg.

Second. It is certain that the maintenance of traffic, on a large scale, on any American inland waterway, not deep enough to accommodate large sea-going ships, is impracticable when exposed to unfettered competition with modern railroad transportation facilities, except under conditions temporarily existing on the Ohio River, and only possible there because of extravagant Government favoritism. The peculiar conditions existing on the Ohio River, which, combined with immense national expenditures, make a limited down-stream coal shipment economically possible during a few months of each year, are found nowhere else in America—probably nowhere else in the world.

Third. It is certain that commerce on the Mississippi River, on a large scale, will always be impracticable, when exposed to unfettered competition with modern transportation facilities—**no matter what depth of water may be maintained in the channel.**

HALSTEAD STREET LIFT BRIDGE, CHICAGO RIVER.
September 23, 1908.

Tug J. C. Evans and Steamer Tiogo, belonging to Erie Railroad Company. This bridge is narrow, the river is on a reverse curve, and is considered a difficult place to get through, especially when there is a current toward the drainage canal. It is said large boats do not go beyond this bridge.

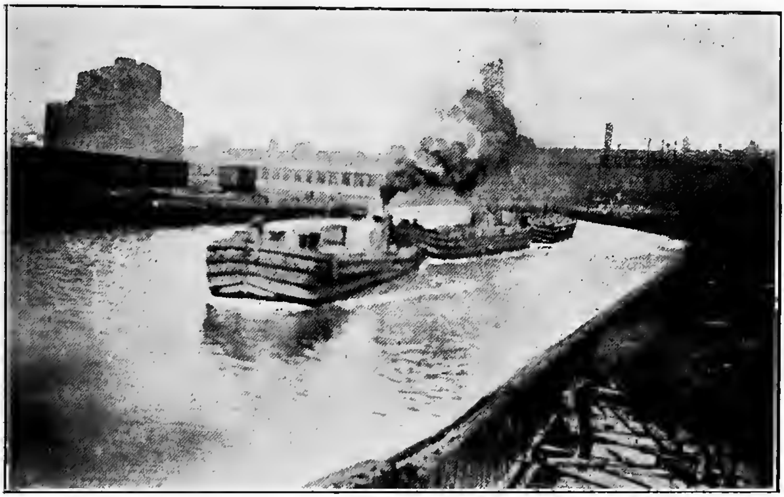
With these matters disposed of, it is easier to discuss the salient features of the proposed waterway from Chicago to the Gulf of Mexico.

We will proceed to consider the several portions of this project in the order of arrangement adopted on pages 125 to 146.

1. The Chicago River—Six Miles.

It is proposed to make this river twenty-six feet deep and at least 200 feet wide, from its mouth at Lake Michigan, to the point at which the Chicago Drainage Canal diverges from it—a distance of about six miles.

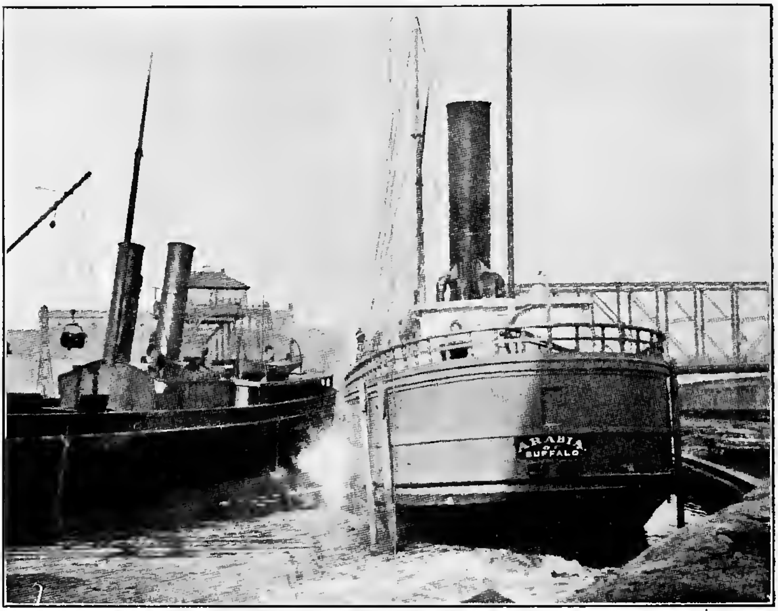
This has not yet been accomplished, though immense sums have been expended by the Chicago Drainage Board, and by the National



CHICAGO RIVER NEAR CHICAGO, BURLINGTON & QUINCY BRIDGE.
Tug with two barges taking entire width of river to make the bend.
September 23, 1908.

Government, in prosecuting the work essential to its realization. The War Department alone has expended (before June 30, 1907) $909,083 on the Chicago River improvement. It is reasonably certain that this portion of the project will, eventually, be carried to completion, in spite of great difficulties, so as to give a channel throughout that will have a cross-section area of not less than 5,200 square feet (26 ft. x 200 ft.). In the fall of 1908, I passed along the full length of this six miles of the Chicago River, in a small boat. The evidences of present congestion were everywhere noticeable, although traffic, on the river,

has declined. There are now twenty-five draw-bridges within the city limits, spanning the portion of the river extending from the end of the drainage canal to the lake. Nine of these are swing-draws, with pivot piers in the channel of the river, which type, it is proposed gradually to eliminate. The others are all either of bascule type, or else perpendicular lifts. There are also a number of draw-



CHICAGO RIVER, SOUTH BRANCH, EIGHTEENTH STREET BRIDGE
November 11, 1899.
From report of U S. Army Engineers.

Commerce on the River has declined over 50 per cent since this picture was taken, due chiefly, it is said, to the fact that there is now a southbound current in the river which greatly interferes with the economic handling of the lake vessels.

bridges crossing the new Drainage Canal, and the number, both in the city and along the canal must be increased indefinitely, as the city grows. These bridges are all placed within a few feet of the surface of the water, and must all be opened every time a boat of any magnitude passes.

In the year 1890, the report of the Chief of Engineers contained this statement:

"The traffic over the bridges in the central portion of the city is enormous, and the opening of one of them interrupts street traffic for blocks away. The river is thronged with lake craft of all kinds both day and night, and the bridges required to be constantly on the swing to permit their passage. At certain hours of the day, however, the pressure of street traffic becomes so great that the bridges are not opened at all, and vessels must wait at their docks or in the

TWENTY-SECOND STREET BRIDGE, CHICAGO RIVER.
September 23, 1908.
Steamer Tioga (Erie R. R.) passing through.

harbor, until the bridges can be opened. It would seem that the present congested and crowded condition of the streets and river, and the excessive cost, would forbid this route as an outlet to the lake."

The congestion of streets and bridges, due to increased population, has grown far worse in the eighteen years that have elapsed since this was written.

Owing, doubtless, to these and other adverse conditions, the traffic on the Chicago River, which was 8,412,992 tons in 1892, had declined to 5,011,786 tons in 1906, though the city increased immensely in wealth and population during the period, and though an immense sum was expended on the work of widening and deepening the river.

CHICAGO RIVER, SOUTH BRANCH, VAN BUREN STREET BRIDGE AND METROPOLITAN ELEVATED RAILROAD BRIDGE.

From report of the Chief of Engineers.
November 9, 1899.

The opening of one of the draw-bridges, during "rush hours" in the morning or afternoon, congests traffic on the streets, on both sides of the river for a block or more in both directions.

The improvement of Chicago River was undertaken for three principal reasons. Mentioned in the order of their relative importance they are:

First. To provide for sewage disposal, without contaminating Lake Michigan, from which the city's water supply is drawn.

Second. To afford a wharf, harbor or slip, extending throughout

the length of the city, along the banks of which boats, plying in the lake trade, might be moored whilst receiving and discharging cargo.

Third. To provide a navigable deep water canal, to be eventually extended, via the Drainage Canal, the Des Plaines River and the Illinois River, to a connection with the Mississippi River.

The projectors of the scheme assumed that the city would, within a few years, have a population that would demand, for efficient sewage, a discharge of 10,000 cubic feet of water per second (333 cubic feet for each 100,000 inhabitants), flowing at a velocity of not exceeding three miles per hour. This three-mile velocity is found by experience to be the greatest allowable in a narrow stream that is to be navi-

STATE STREET BRIDGE OVER CHICAGO RIVER.
September 22, 1908.

gated by vessels of the type that ply on the Great Lakes. It was assumed that the War Department would permit the city to take from Lake Michigan this 10,000 cubic feet per second. When the Drainage Canal was finished, in 1900, it was found that it had an actual capacity for 14,000 cubic feet per second, and that the Calumet River also could be diverted so as to send 4,000 cubic feet of water per second, through the Drainage Canal, and thus give a total diversion from Lake Michigan of 14,000 cubic feet per second. The War Department has, up to this time, refused to permit a diversion of more than 4,167 cubic feet per second.

It is shown by the engineers of the United States Army Corps (see House Document No. 6, 59th Congress, 1st Session) that the diversion of 14,000 cubic feet per second from Lake Michigan will permanently lower the level of that lake and Lake Huron nine inches; that it will lower the level of Lake Erie eight inches, and that it will have a pronounced deleterious effect on the St. Clair River, Lake St. Clair, the Detroit River, the Welland Canal, Lake Ontario, the St. Lawrence River and the Niagara Falls. The International Waterways Commission stated (see War Department Document No. 293), after most elaborate investigations, that the effects of such diversion from the lakes

RUSH STREET BRIDGE, CHICAGO RIVER.
September 22, 1908.

would entail an expense of $10,000,000 for deepening connecting channels and the harbors now in existence along the lake shores, and of $2,500,000 for similar work on the Welland Canal and the St. Lawrence River. This estimate does not include damages to the Niagara Falls or increased cost of developing other harbors in the future.

To this the Chicago Sanitary District makes reply that examinations have been made which show that an expenditure of $796,923 in works that would regulate the flow of water, from Lake Superior through St. Mary's River, would fully compensate for the amount that they wish to abstract from Lake Michigan. To this the rejoinder is

that if such regulation can be effected it should be utilized to increase the depth of the lakes so as to make the use of larger vessels feasible—increasing the depth of water in the harbors and connecting channels of the lakes by six inches or more would be of immense benefit to shipping interests, because it would enable vessels to bear heavier burdens and thereby effect much saving in cost of transportation. The interests opposed to permitting the diversion of water from the lakes are powerful. They include the Canadian Government, the Lake Marine of both the United States and Canada, and many of the great cities located along the lake shores.

The International Waterways Commission (See War Department Document No. 293, 1907) concludes its report with the following recommendation:

"We, therefore, recommend that the Government of the United States prohibit the diversion of more than 10,000 cubic feet per second for the Chicago Drainage Canal."

Col. W. H. Bixby, Corps of Engineers, U. S. A., reported to General A. Mackenzie, Chief of Engineers (See Document No. 6, 59th Congress, 1st Session, Committee on Rivers and Harbors), in May, 1906, that:

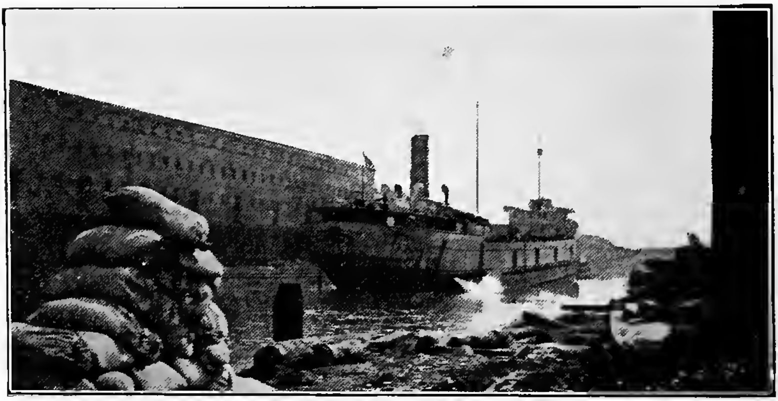
"In my opinion, the War Department must look forward to a future not unreasonable demand for from 20,000 to 30,000 cubic feet per second for navigation and sanitary purposes, to be taken out of Lake Michigan, at points along the Wisconsin, Illinois and Indiana shores."

Thirty thousand cubic feet per second would lower the level of Lake Michigan (see page five of Col. Bixby's report) one and six-tenths feet, and would probably involve remedial expenditures three or four times as great as would be made necessary by the six-inch lowering contemplated by the International Waterways Commission. Again, Col. Bixby states, and seems clearly to prove, that it will become wholly impracticable to use the Chicago River, when fully improved, for more than one of th ethree purposes for which it was designed. Either it must be used for sewage alone, or for wharfage alone, or for navigation alone, because its capacity is manifestly insufficient to admit of more than one of these uses.

General W. L. Marshall, now Chief of Engineers, U. S. A., said, in a report on the Chicago River, in 1890:

"**Any marked current** in such an obstructed stream means damage to the heavy and unwieldly vessels that frequent it, especially if built of metal; and a current of even less than three miles an hour obstructed by numerous stone piers, a multitude of vessels, and many sharp bends will have its effect upon rates of insurance and upon the minds of vessel owners and the owners of dock properties."

Col. Bixby shows that with a discharge of 14,000 cubic feet per second, through the canal, conditions might arise under which the velocity would be over six miles per hour.



PENNSYLVANIA RAILROAD COMPANY'S STEAMER DELAWARE, CHICAGO RIVER.
September 23, 1908.

Inasmuch as the improvement was primarily designed for sewage, which is absolutely indispensable to the health of the inhabitants of Chicago, and inasmuch as it is entirely practicable to construct ample and commodious slips, harbors and wharfage facilities along the lake front and along Calumet River and in Calumet Lake; and inasmuch as the navigation of this and other portions of the proposed "Deep Waterway—Chicago to the Gulf" is a palpable absurdity, it seems probable that, in the course of time, the Chicago River will be relegated to sewage purposes alone.

It is manifest, therefore, that the first section of the proposed "Deep Waterway, from Chicago to the Gulf," does not offer much to encourage the promoters of that wild scheme.

(2) Chicago Drainage Canal—Thirty Miles Long.

The "Chicago Sanitary Ship Canal," thirty miles long, extends from the south end of the portion of the Chicago River above discussed, to a power plant that has been built in the valley of the Des Plaines River, about two miles above Joliet, Illinois. It has been made twenty-two feet deep (twenty-four during periods of high water in the lake) throughout, and is designed to be, eventually, nowhere less than 160 feet wide at the bottom, and 162 feet wide at the surface of the water. It has a capacity of discharging 14,000 cubic feet of water

CHICAGO RIVER, SOUTH BRANCH. METROPOLITAN ELEVATED RAILROAD BRIDGE.

November 9, 1899.

From report of the Chief of Engineers.

per second at a velocity of 1.9 miles per hour. By excavating this canal and deepening and widening the Chicago River, the direction of flow of the latter has been reversed, and it now empties its water southward into the Des Plaines River, instead of northward into Lake Michigan. The construction of this canal was a tremendous undertaking. The sanitary district of Chicago has expended upon it and auxiliary

power plants, etc., about $55,000,000, and yet it is not completed—a block of material ninety-two feet by twenty-four feet by 7.8 miles (containing about 3,368,000 cubic yards) is yet to be excavated. Water was turned into the canal on January 2, 1900. Though more than eight years have now elapsed, there has been, so far as I can ascertain, practically no navigation or freight shipment on the canal except some broken stone from the spoil banks along the berme of the canal.

The primary object of building the canal was to provide a means for ridding the city of Chicago of her sewage, without discharging it into Lake Michigan, whence the city's water supply is drawn. A secondary object was to provide a slip, or harbor, extending clear through the city (which is expected to grow enormously), along which manufacturing plants may be established and docks provided for boats. A third object was to provide a connecting link in the "Deep Waterway" from Chicago to St. Louis (or to the Gulf of Mexico?), and a fourth object was to create a water power that it was hoped might prove profitable, and, in some measure, reimburse the city for the immense cost of the canal.

The City of Chicago is now pleading with the National Government for permission to divert from Lake Michigan, through the Chicago River and the Calumet River, 14,000 cubic feet of water per second. If such permission be not secured, only a portion of the contemplated power can be developed. The amount of sewage that can be conveyed through the canal also depends on the amount of water that the Government will allow the city to take from Lake Michigan—so far, the War Department has granted permission for only 4,167 cubic feet per second, and that is now sufficient for sewage. The velocity required to discharge the present flow does not render navigation of the canal or Chicago River impracticable, though there has been much complaint and protest from shipping interests, and commerce on the river has, from some cause, or combination of causes, greatly declined since the flow of the river was reversed and the speed of its current greatly increased.

It is impossible to say what final action the Government will take, since serious international questions and far-reaching effects on the navigation of the Great Lakes and of the St. Lawrence River are involved. In any event, the dimensions of the canal are such that it will be impracticable to use it for the four purposes for which it was designed. Without the increased flow the canal will not carry off the sewage or supply water needed for improving navigation on the lower

Illinois River—with the increased flow necessary for sewage disposal, the velocity will become too great to admit of navigation and wharfage uses by the Lake Marine.

It is probable that for many years, the canal will be used for sewage and wharfage, but as the city grows the demands for sewage will increase to such an extent that it will be found inexpedient to allow the flow of water in the canal to be obstructed by boats, either moving or moored to the banks, and it will also probably be found impossible to navigate so narrow a channel because of the velocity of the current. Since sanitation is absolutely indispensable, and the city has expended vast sums in preparing for this mode of ridding her-

THE LONELY CHICAGO SHIP CANAL AS SEEN FROM WILLOW SPRINGS, LOOKING WEST.

It has cost near $60,000,000, is still unfinished, and though it has been in use nine years, it bears no commerce.

self of her sewage, it seems probable that the Government will finally permit the flow of water required for sewage purposes, and make some arrangement for deepening the lake harbors and connecting channels, to compensate for the injury resulting to navigation interests.

The people of Chicago have been flattered by a promise that the flow of water through the canal will develop 43,000 horse-power, at its south end, which may be sold at $25 per horse-power, per annum, and net a revenue of $1,075,000. This computation is based on an assumed flow of 14,000 cubic feet per second. As matters now stand, the actual flow is only .29 of that on which calculations were based, and re-

cently a large portion of this small power was leased at $15.00 per horse-power, per annum.

The people of Chicago have also been flattered with promises that the canal will become a part of a deep waterway that will bring an immense commerce through Chicago, from the Mississippi Valley, from the Gulf of Mexico and from the Great Lakes, all of which is manifestly impossible and absurd.

(3) Canalizing the Des Plaines and Illinois Rivers.

Power Plant to Utica—61.5 Miles.

The Des Plaines River and the Illinois River, from Joliet down to Utica, are shallow streams, flowing most of the way along an ill-defined rock channel, in a valley usually from one-fourth of a mile to one mile wide. The natural banks are low, owing, perhaps, to the fact that the present small stream is (geologically) of recent origin and has made comparatively little impression on the solid rock bed of the valley once occupied by a great river. Before the water from Lake Michigan was diverted into the Des Plaines River the low-water flow of the Illinois River, at La Salle, sixty-six miles below Joliet, was only 500 cubic feet per second.

The Illinois River below Utica is a shallow stream, with low banks, rarely reaching more than four or five feet above low water line, flowing through a wide, alluvial valley, with only thirty-three feet fall in the 229.5 miles between Utica, at the head of navigation, and Grafton, at the mouth of the river. In this wide valley there are many swamps and shallow lakes. A few feet rise, in either river, overflows the adjacent territory and floods large areas of flat land.

In 1890, Captain Marshall (now General Marshall, Chief of Engineers) reported:

"Now, at any little summer freshet, producing a discharge exceeding 8,000 cubic feet per second at La Salle, damage by overflow would begin at that point, the artificial discharge being 10,000 cubic feet per second, and with greater natural discharge become more and more widespread as we progress down stream, at times when such overflows would not otherwise occur. Upon all rises of the river producing anywhere near bank-full stages this artificial discharge would cause flowage damages that would not otherwise occur. The lands would become submerged at high water earlier and the water remain upon them longer than it otherwise would. From 100,000 to 300,000

acres of lands in the Illniois River Valley will be subject to such conditions."

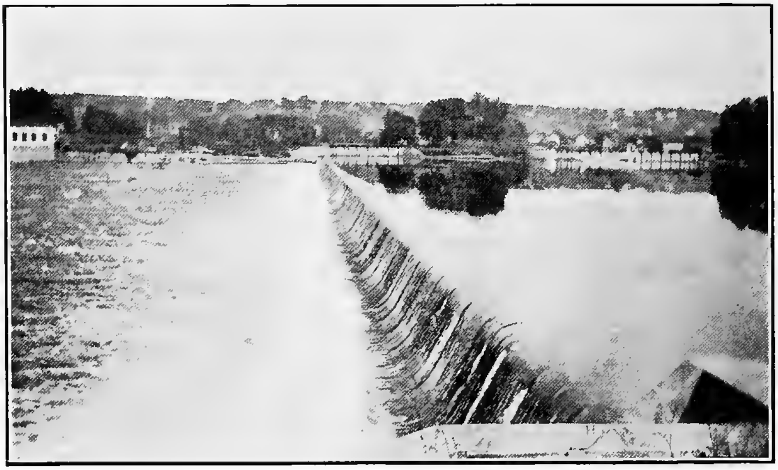
The city of Chicago made no provision, below Joliet, for taking care of the water that she is diverging from Lake Michigan and turning down through this valley. One result is that the low-water flow, at La Salle, has been increased over nine-fold (from 500 to 4,600 cubic feet per second), and, previous to December, 1905, 224 suits had been brought against the Trustees of the Sanitary District of Chicago, by landowners in the valley, for damages alleged to aggregate $4,409,180. If the flow from Lake Michigan should ever be increased to 14,000

VIEWS OF THE DES PLAINES RIVER JUST BELOW THE POWER HOUSE NEAR JOLIET.

This is a part of the proposed Lakes-to-the-Gulf Deep Waterway and shows conditions after a cloud-burst that occurred January 19, 1907.

cubic feet per second, which is twenty-eight times as much as the natural low-water flow at La Salle, sixty-six miles below Joliet, it is evident that a large part of the valley of the Des Plaines and Illinois Rivers would be swamped and that the damages would be stupendous (300,000 acres at $200 per acre would aggregate $60,000,000.00)! What weight these facts may have had in producing the "popular demand," which first emanated from Chicago, for "Fourteen feet through the Valley," to be built by the State or National Government, I have no means of determining. I have never heard any one state that it had any such weight, but one's suspicions are likely to be aroused by the circumstances.

On June 13, 1902, Congress made an appropriation of $200,000 for surveys for a fourteen-foot waterway from the south end of the Chicago Drainage Canal (which was then at Lockport, five miles above Joliet) via the Des Plaines, Illinois and Mississippi Rivers, to St. Louis. Elaborate surveys were made, and on December 18, 1905, the Secretary of War sent to the Speaker of the House of Representatives a letter of transmittal from the Chief of Engineers (See House Document No. 263, 59th Congress, 1st Session), which concludes with the following significant remark:



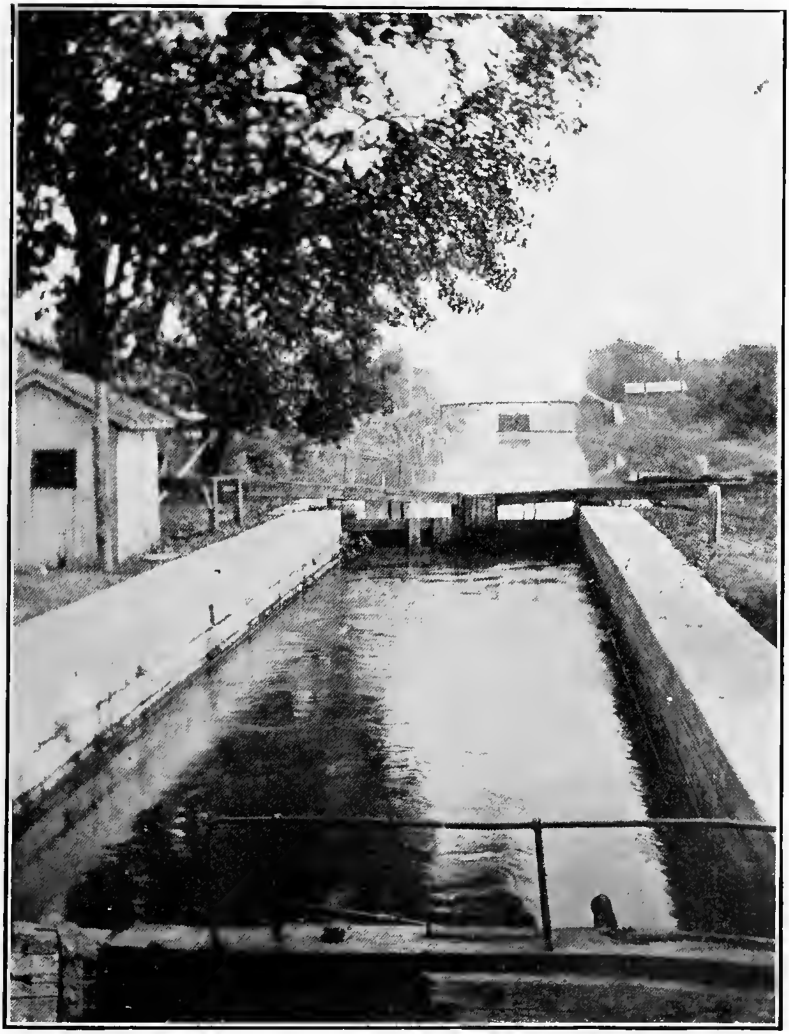
POWER DAM, ILLINOIS RIVER, MARSEILLES, ILL.
The "Deep Waterway" project proposes the destruction of this dam.

"No opinion is expressed in these reports as to the advisability of undertaking the project. Such opinion is not called for in the act ordering the survey."

The present Chief of Engineers, recently promoted to that high office, has spoken much more strongly on this subject. In a report dated Chicago, Illinois, January 27, 1897, he said:

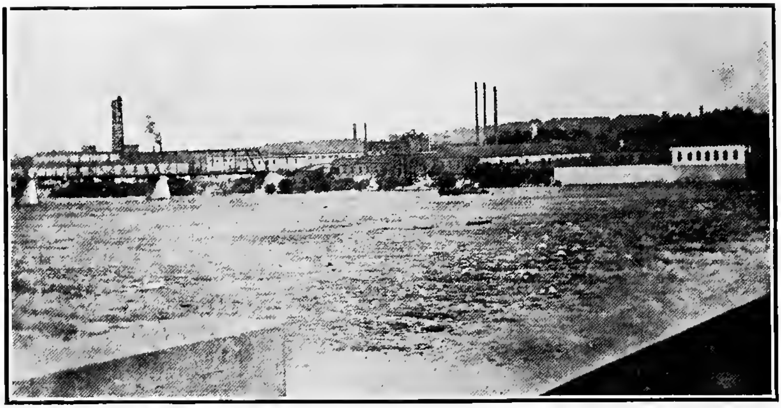
"The line occupies no very urgent route of transportation. There is no large and pressing bulk of heavy commodities demanding cheap transportation over the line, such, for instance, as between Buffalo and the sea, or between the Pittsburg District and the Great Lakes.

The most that can be expected of it is the control of cost of transportation by rail so far as to limit maximum freight charges over competing roads. It is not likely that the unwieldy and frail Mis-



UPPER AND LOWER LOCKS, ILLINOIS AND MICHIGAN CANAL AT MARSEILLES, ILL.
September 24, 1908.

sissippi river boats would ever make use of a canal 160 feet wide, as long as one from Lake Joliet to Chicago, especially when there is encountered therein a current."

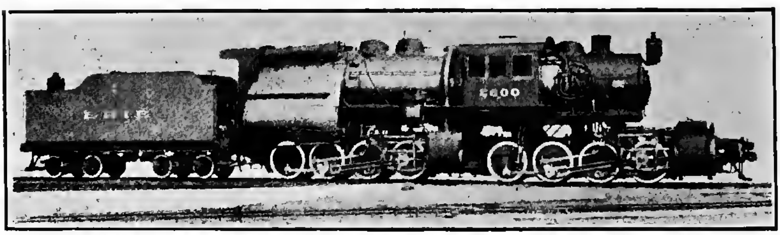


MANUFACTURING DISTRICT, USING WATER POWER, MARSEILLES, ILL.

BALDWIN LOCOMOTIVE WORKS.

Mallet Articulated Compound Locomotive built for Great Northern Railway Company.

Weight on driving wheels	316,000 lbs.
On truck, front	19,000 lbs.
On truck, back	20,000 lbs.
Total Engine	355,000 lbs.
Total Engine and Tender, about	503,000 lbs.



THE MOST POWERFUL LOCOMOTIVE EVER BUILT.

It weighs 573,000 pounds, and can haul a train two miles long carrying 10,000 tons of freight.

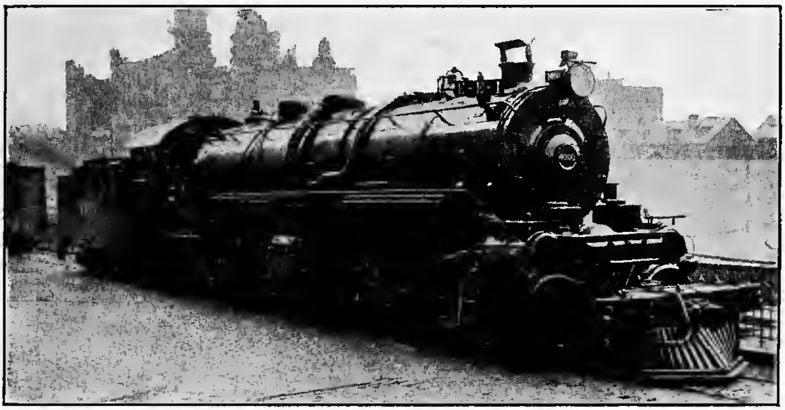
(From Putnam's Monthly—Issue of March, 1908.)

The report of the Board of Engineers, dated August 26, 1905, says:

"The freight which moves between Chicago and St. Louis is now carried by three railroads—the Chicago & Alton, the Illinois Central and the Wabash. During the fiscal year ending June 30, 1904, the quantity of freight moved by these three roads from Chicago to St. Louis was 449,115 tons, and from St. Louis to Chicago was 633,182 tons."

The total freight moved, therefore, was 1,082,297 tons.

The prairie country lying between the two cities is remarkably smooth, and railroads with grades nearly level may be built at comparatively small cost. A locomotive has recently been put in service



GIANT MALLET TYPE LOCOMOTIVE, BUILT BY BALDWIN LOCOMOTIVE WORKS.

Built for the Southern Pacific Railroad. Weight of locomotive and tender, approximately 300 tons. Tractive power, 95,000 pounds. This locomotive can move a train weight of 15,834 tons on a level track.

on the Erie Railroad that can, on a level track, propel a train weighing 10,000 tons. A single Mikado locomotive has recently hauled a train load of 7,000 tons over the new Virginian Railway, from Norfolk, Virginia, to Roanoke, Virginia, the latter town being 1,000 feet above the level of the former; and single locomotives have recently hauled train-load of 6,922 tons on the Pennsylvania Railroad; and a giant "Mallet" type locomotive has recently been built, for the Southern Pacific Railroad, that is capable of moving a train-load of nearly 16,000 tons on a level track. Existing conditions forbid the handling of trains of such weight, but as grades are reduced, lines straightened,

and roadways improved, the weight of trains is being constantly increased. The distance between Chicago and St. Louis, by the way of the three railroads mentioned is 286 miles, as an average. Fifteen locomotives of only one-fourth the power of the first one above mentioned, running at a speed of twelve miles an hour, could have hauled the entire tonnage between the two cities, on a single track, in less than six weeks.

Cars are loaded on side tracks, both at St. Louis and Chicago, that reach nearly every important manufacturing plant in both of the cities. The railroads in the two cities have connecting lines that make possible a cheap and quick interchange by means of which a loaded car can be placed at the door of almost every industry in either city.

BIG TRAIN ON THE VIRGINIAN RAILROAD.

Weight behind engine, 7,562 tons. Coal carried, 5,500 tons.
From Railroad Age Gazette, October 22, 1909.

Cars reaching either city destined to points beyond may be quickly shifted to other lines or systems and sent forward, without breaking bulk ana without loss or damage due to rehandling.

The proposed waterway is to be about 365 miles long between St. Louis and Chicago. The water front in both cities is congested, and increased facilities are wholly impracticable in the business and manufacturing districts, where they would be most needed. Only a small per cent of the big industries or manufacturing plants have access to the water front, and the building of branch canals, to give such access, is impossible.

Much of the proposed waterway is to be a canal on which the average speed of boats will not exceed five miles per hour, and the

length of the waterway will be about seventy-nine miles greater than that of the rail lines. The canal and rivers will probably be frequently closed to navigation by ice from two to three months during the winter; extreme high water makes the economical loading and unloading of boats at St. Louis impracticable, if not impossible. Tonnage from either city bound for inland points beyond the other city must necessarily be transferred, hauled by drays considerable distances and reloaded into railroad cars at great expense and subject to much loss and damage.

Is it reasonable to suppose that any considerable portion of the 1,082,297 tons would leave the quick, convenient and certain rail line and choose the slow, hazardous and uncertain water line, with the probability of the latter's entailing much the greater cost before the shipments reached their final destination? With all this known, is it reasonable to suppose that the railroad managers would consider such a competition a factor in adjusting rates? Absurd.

An analysis of the report of the Chief of Engineers, dated December 12, 1905, on the improvement of the Illinois River, shows the following divisions of the estimate for cost of a fourteen-foot waterway from Lockport to St. Louis:

From Lockport to Utica—Canalized river with nine locks and five new movable dams—62 miles (channel at least fourteen feet by 200 feet)	$15,355,900.00
Utica to Grafton; 229 miles, dredging channel fourteen feet deep by 200 feet wide at bottom	8,187,682.00
Improvement, Grafton to St. Louis	6,553,880.00
Total	$30,097,462.00

This, of course, does not include the damage claims already brought against the city of Chicago. Since this report was submitted, the Congress has taken no further action and it was understood that the Committee on Rivers and Harbors, of which Congressman Burton, of Ohio, was then chairman, did not look with favor upon the proposed expenditure.

During several months previous to the last presidential election, a proposition was agitated in Illinois that reminds one very forcibly of those palmy days of reckless speculation in England and France during which John Law was so prominent in financial circles.

The Chief of Engineers having made a report on the proposed extension of the Deep Waterway, from its present terminus, near Joliet, to St. Louis, that was distinctly unfavorable in its tone; and it being understood that the chairman of the Rivers and Harbors Committee of the House of Representatives is not favorably disposed toward the wild scheme, the local boomers seemed to have despaired of obtaining any immediate help from the national treasury and to have turned their attention to the State of Illinois, which is one of the richest commonwealths in the Union. Last year that State was flooded with pamphlets and statements alleging that the Drainage Canal may be extended sixty-one and a half miles, from the power plant below Lockport to Utica, with a "preliminary depth" of fourteen feet, with locks 800 feet long, eighty feet wide, and with twenty-four feet of water over the mitre sills at a cost of......$14,318,986.00

That the cost of developing 140,000 gross horse-power, with four power houses and equipment complete will be—	3,600,000.00
That right of way will cost only	340,000.00
And that the total cost will be........................	$18,258,986.00

It is further stated that the canal power plants can be put into operation in six years and that the water power will begin to show profits in the seventh year. It is "estimated" that the net salable horse-power will be 100,000; that the whole power will be rented, immediately on completion of the work, at $25.00 per horse-power, per annum; that there will be a net earning of $1,700,000 the first year, available for a sinking fund; that in fourteen years the whole capital invested, together with accrued interest (4 per cent), will have been paid, leaving a balance, over and above all expenditures, of $2,355,-694.85. This and similar literature was distributed at the last Lakes-to-the-Gulf Deep Waterways Convention, under the appropriate name of "Deep Waterway Dope." Its effectiveness in benumbing the brains of the voters is seen in the fact that at the fall election last year the vote on the $20,000,000 bond issue was affirmative and that measure was approved by a large majority.

The magnificent showing above made reminds one strongly of the Leighton-Roosevelt reservoir scheme; of the olden time Louisiana wild oxen covered with fine wool "finer than any sheep," and of the ancient propositions "For extracting Silver from Lead," and "For Making Salt Water Fresh."

The published estimate seems to ignore the cost of operation and maintenance. Statistics show that this cost is about $226,486.60 (or $8,466.79 per mile per annum) for the fourteen-foot Welland Canal, and about $1,300,000, or $14,444.00 per mile per annum for the Suez Canal. Perhaps this oversight was due to the fact that during the eight years that the existing thirty miles of the Drainage Canal have been in service, there has been no navigation thereon.

All this is of only academic interest to persons not dwelling in Illinois, and it is a foolish business to "take a dog by the ears" when you have no interest in the battle that he is waging; but it would seem that no harm can be done by inquiring whether, in basing this estimate on the assumption that permission will be obtained for diverting 14,000 cubic feet of water per second from Lake Erie, the attention of the voters was called to the fact that a powerful opposition is to be overcome, composed, first, of the great lake marine interests with a stupendous traffic that must be injured, or deprived of great possible benefits; second, of rival cities along the lake shores whose harbors and traffic must be injured, or deprived of great possible benefits; third, of the Government of Canada, whose harbors and connecting channels must be injured or deprived of great possible benefits. Of course, Canada must protect, by every possible means, her own marine interests that are bound up in her lake ports, in the Welland Canal, in the St. Lawrence Canals and in the great twenty-four-foot ship canal from Lake Huron to Montreal, upon the construction of which the Dominion seems about to enter. All these interests must suffer if 14,000 cubic feet of water per second be diverted from the lakes through the Chicago Canal.

Were the voters advised that a large portion of the small water power now being developed at Joliet is being leased for $15.00 per annum, per horse-power, instead of $25.00, though the plant is in the outskirts of Joliet, a manufacturing city of 40,000 population, and only thirty miles from Chicago, which has a population of over 2,000,000? Do they know that the power being developed at Joliet is limited to about one-fourth of that which had been expected and promised as a result of the huge expenditure made to utilize the power?

Were the voters advised that the success of the whole scheme depends on the ability of the State to buy or condemn the property of the Economy Light & Power Company, which has a dam across the Des Plaines River, at Dresden Heights, twenty miles below Joliet? A writer in the Chicago "Record-Herald" of June 26, 1908, states that

the rights held by the Economy Company are now valued at $15,000,-000. The State has been trying to force the owners of the plant to surrender their rights, in favor of the proposed canal. The continued existence of this dam and power plant make the canal scheme impracticable for many years yet to come. Sometime ago the State of Illinois secured an injunction to prevent the owners of this plant from improving their dam. The case was tried before Judge Mack, in Chicago, on June 25, 1908. Judge Mack decided against the State, dissolved the injunction, and the canal is barred for about sixteen years, unless the Supreme Court reverses Judge Mack's decision, or the property of the Economy Company be condemned or purchased.

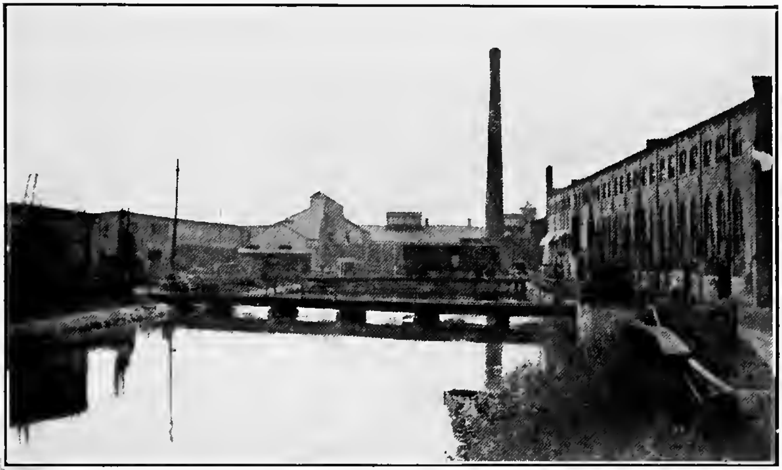
It is stated that the route of the canal may be changed so as to avoid the Dresden Heights dam. The diversion proposed would increase the cost of building the canal by many millions of dollars—perhaps make the twenty miles from the existing new power plant above Joliet to Dresden Heights cost from $30,000,000 to $40,000,000, for a twenty-four-foot canal.

Was the attention of the voters attracted to the fact that the normal low-water flow of the Illinois River, at La Salle, was only 500 cubic feet per second, previous to the increase due to the diversion of water from Lake Michigan; whilst the high-water flow was about 65,000 cubic feet per second? Did the voters realize that, during periods of high water, the dams and power plants will be flooded and rendered temporarily useless, thereby reducing the value of the power? Were the voters advised that there are now in existence other power plants in the Illinois River between Joliet and La Salle that will certainly give trouble?

Did the voters of Illinois realize how unreliable the preliminary estimates of the cost of canals and other great public works usually are? Were the voters aware of the visionary character of the estimates of the value of the water power? Are these estimates any more reliable than were the original estimates and statements given to the people of Chicago, before the construction of the Drainage Canal was begun, and during the progress of that work?

It is interesting to consider this last question in the light of published statements, taken from back numbers of "Engineering News," issued during the period of the construction of the thirty miles of the Chicago Drainage Canal, which yet requires about 3,168,000 cubic yards of excavation to fully complete its dimensions.

In 1898, Geo. W. Alrige, Superintendent of Public Works of New York, under date of October 30, in an attempted explanation of the inconsistencies between the preliminary estimates for the cost of the Erie, Champlain and Oswego Canals, and their subsequent actual cost, presented the following comparison between the original estimates and the actual cost of various notable public works:



FACTORY DISTRICT USING WATER POWER, MARSEILLES, ILL.

Name	Original Estimate	Actual Cost
Erie Canal	$ 4,926,738	$ 7,143,789
Enlargement of Erie Canal	23,402,863	32,008,851
Oswego Canal	227,000	565,437
Enlargement of Oswego Canal	1,926,339	2,511,992
Champlain Canal	871,000	1,746,062
Black River Canal	1,068,437	3,157,296
Hoosac Tunnel	1,948,557	20,241,842
Manchester Ship Canal	26,000,000	67,351,105
Chicago Drainage Canal	12,000,000	*37,641,652 (To date)
Hudson River Improvement	2,000,000	2,000,000
Estimate to complete		2,600,000
State Capital at Albany	4,000,000	24,000,000

(*This includes $27,303,216 already expended and an estimate of $10,338,436 to complete the work.)—Engineering News, November 3, 1898.

Note that the original estimated cost of the Chicago Drainage Canal was $12,000,000, and that in 1898 the actual cost had reached $27,303,216, and it was then estimated that it would cost $10,338,436 to complete the work.

On December 15, 1898, Mr. Isham Randolph, Chief Engineer of the Chicago Drainage Canal, attacked the above statement and claimed that the original estimated cost of the Chicago Drainage Canal, as stated in the report of Mr. W. E. Worthen, Chief Engineer, for an eighteen-foot waterway, was $25,700,000. Mr. Randolph then estimated that the total cost of the canal, when completed, would aggregate $28,411,920, to which, he stated, might be added interest charges up to July 1, 1900, amounting to $3,469,804.85, and suggested a further allowance of ten per cent, or $250,000, be made to cover contingencies. This last mentioned estimate included right-of-way and land amounting to $3,141,807.62.

That was in December, 1898.

It is now stated that the actual total cost for all purposes, to December 31, 1907, was $58,616,014.44. The original proposition was for a canal extending to Lockport. The canal as built is about two miles longer and includes a power plant near Joliet. There is a section of the canal, about seven and eight-tenths (7 8-10) miles long, that yet requires to be widened about ninety-two feet, and we find in the reports of the Chief of Engineers that the United States had contributed $909,083 for the widening and deepening of the portion of this waterway within the limits of the original Chicago River, previous to June 30, 1907.

Mr. Isham Randolph, a very able and distinguished engineer, is still interested in this work, and signs the estimate of a cost of $18,258,986 for the sixty miles of fourteen-foot (preliminary depth) waterway, with locks eighty by 800 feet, having twenty-four-foot depth of water over the mitre sills. This estimate also includes the cost of four power houses, with equipment complete.

On February 21, 1895, the following statement was published in the "Engineering News":

"The Chicago Drainage Canal, now under construction, is to cost $27,803,216, according to the latest figures submitted to the Trustees of the Chicago Sanitary District, by the Joint Committee on Engineering and Finance, and the estimates of Chief Engineer Randolph. The total cost of the work now under construction is set down at $18,991,478; work yet to be contracted for is estimated at $8,883,899, includ-

ing controlling works, bridges and channel through Joliet. The right-of-way cost $2,600,000."

Theory and practice seem distinctly antipodal among men afflicted with "water-on-the-brain."

In connection with the question of the value of water power the following excerpts from the "Engineering News" are interesting. In an editorial in that journal for February 23, 1899, it was prophesied as follows:

"Now that the city is undertaking to secure the development of this power, however, we are strongly of the belief that for every dime that Chicago may gain through the use of the Drainage Canal, as a waterway, it will gain a dollar through the rental of its water power."

This is probably a wise and judicious forecast. The prophet evidently could not foresee many dollars of revenue from water power, since **naught multiplied by infinity is still just simply nothing.**

The value of water power was estimated at $25.00 per horse-power, per annum, in the preliminary estimates, and in the showing made to the Chicago voters. When the canal was nearly completed, the horse-power to be developed was widely and industriously advertised, and it appears that for a long time no bids were received. Finally, sometime about the middle of the year 1899, Mr. Clarence Buckingham, reported to be a representative of the Diamond Match Company, made an offer of $5.00 per horse-power, per annum, less a rebate of $2.50 to his company, to reimburse it for the cost of its investment in plant, provided he could get a lease for fifty years.

On August 31, 1899, the "Engineering News" said of the bids that had been received by the Trustees of the Drainage Canal: "Only two bids were received; Clarence Buckingham, $5.00 per horse-power, per year, for a fifty-year franchise; John Norton, president of the Economy Heat and Power Company, of Joliet, $5.00 per horse-power, per year for a seventy-five year or ninety-nine year franchise."

The public is not advised as to the revenue now actually being obtained, but the contrast between the above quoted offers and the preliminary estimates are all the more striking when we reflect that the amount of power developed is only about one-fourth of what was expected, because the desired flow of water from the lakes is not permitted and may never be permitted.

The Drainage Canal is a magnificent engineering achievement and its great cost will probably be justified by its sanitary efficiency. The hopes as to water power will probably never be fully realized and the hopes as to navigation will certainly never be realized in any considerable measure.

What will the sixty miles of waterway, from the power plant above Joliet, to Utica, have cost when completed to twenty-four-foot depth? It is impossible to say, but in the light of previous experience, we believe that an estimate of $100,000,000 for the waterway, not including power plants, would be extremely conservative. The Drainage Canal, having the same cross section, thirty miles long, has cost over $58,000,000, though not yet completed. The Manchester Ship Canal, thirty-five and one-half miles long, twenty-six feet deep, and 170 feet wide, cost about $75,000,000. The Suez Canal, thirty-one feet deep and ninety miles long, through sand excavation and shallow lakes, without locks and dams, cost $100,000,000, though eight miles of it required no excavation, though there was no expenditure for right-of-way, and though the labor was extremely cheap. It is true that it is less costly to canalize a river than to form a canal where there is no existing channel, but in this instance the original low-water flow was only 500 cubic feet per second, even at the lower end of the proposed canal, and the small stream has made comparatively little impression on the rock-ribbed valley.

To form a canal by excavating would involve a tremendous amount of solid rock cutting, much of it under water; and to form it by erecting dams across the valley would flood much valuable territory along the river and its tributaries, including railroads and manufacturing plants, a large part of the city of Joliet (population about 40,000), and parts of several smaller towns and villages. Of course, earth levees and masonry walls may reduce the flowage damage, but such works are immensely costly.

The distance from the end of the Chicago Drainage Canal to Dresden Heights is twenty miles. At that place the Des Plaines and Kankakee Rivers unite to form the Illinois River, and here the Economy Light & Power Company has a dam across the Des Plaines River. There is another dam at Joliet, and another at Marseilles. At the last mentioned town the dam was built in 1867. Some of the old leases run for ninety-nine years at $10.00 per horse-power, per annum. The projected waterway would destroy this plant and a prominent operator

in Marseilles says that he thinks it would take several hundred thousand dollars to buy up the old leases.

In view of all this, $100,000,000 would seem a very conservative estimate of cost. The patriots, who built the new Pennsylvania State Capitol, would probably feel disgraced, if they had charge of the canal construction, and allowed a wild duck to swim on the water therein, before the actual cost had reached a quarter of a billion.

COPPERAS CREEK LOCK AND DAM, ILLINOIS RIVER.
This lock and dam to be removed for "Deep Waterway" Project.

(4) Improving Illinois River—Utica to Grafton.

229.5 Miles.

This portion of the Illinois River flows through a wide, flat, alluvial valley. The banks of the stream are very low, and when the water rises a few feet, it spreads out over a wide area. The Chief of Engineers has estimated (see official report) that the channel can be dredged so as to afford fourteen feet of water 200 feet wide (assuming that the War Department will permit the abstraction of 10,000 cubic feet per second from Lake Michigan), at a cost of $8,187,682.00. The National Government has already expended on locks and dams in this portion of the Illinois River $1,515,720.77, besides which the State of Illinois had expended $747,747 on locks and dams at Henry and Copperas Creeks. All this work must be destroyed in carrying out the new improvement schemes.

In 1908 traffic on the river had declined to 15,375 tons. Twenty-two years earlier, in 1886, it had been 93,185 tons. When I was passing along this river, between Grafton and Peoria, last year, I heard it stated that it seemed probable that the one small packet boat running between St. Louis and Peoria would be discontinued, owing to the small amount of commerce.

The report of the Chief of Engineers states that the estimate above quoted ($8,187,682.00) does not include the cost of land that would be flooded, because this item should be borne by the city of Chicago, for whose benefit the 10,000 cubic feet per second of additional water may be added to the flow of the river. The report states that the area of such over-flowed territory would aggregate 36,790 acres between Utica and Beardstown (140 miles). No estimate is made of the area that would be flooded between Beardstown and Grafton (eighty-eight miles), but it is stated that it would be comparatively small. Forty thousand acres submerged would seem a conservative estimate for the whole of the 229.5 miles between Utica and Grafton.

In estimating the value of lands required above Utica, the report places about half of it at $100.00 and half at $150.00. The lands along the lower river are much better than those above. If we estimate the value of the 40,000 acres in the alluvial valley at $200 per acre, we have at once $8,000,000 in addition to the estimate of the Chief of Engineers, or a total of $16,187,682.00.

It is not pertinent to the present discussion to ascertain who will have to pay this $8,000,000, but if the flow from Lake Michigan, through the Chicago River, ever be increased to 10,000 cubic feet per second, somebody will have to pay some such amount. Should the flow ever be increased to 14,000 cubic feet per second, the area flooded will be much greater. As stated before, with a flow of only 4,167 cubic feet per second, suits for alleged damages aggregating $4,409,180 had been entered previous to December, 1905. General Marshall, now Chief of Engineers, U. S. A., stated in 1890 (see pages 234-5) that from 100,000 to 300,000 acres would be subjected to damaging conditions by an increased flow of 10,000 cubic feet per second. It is now proposed to make it 14,000 cubic feet per second.

The Illinois International Improvement Commission issued a pamphlet, bearing date February 27, 1907, with the title, "The Lakes and Gulf Waterway." This is a most interesting and diverting dissertation. On page twenty-eight we find this: "Floods have been recorded in the Mississippi River at Grafton (mouth of the Illinois River),

higher in elevation than the criginal low water plane at Utica." Utica is 229 miles up the Illinois River, above Grafton. Under the conditions described there should have been little or no current in the whole length of the Illinois River between those points. Even when the Illinois is at high stage there is little current, if the Mississippi be also high. In this remarkable condition is found an explanation of the fact that sediment and detritus brought into this portion of the Illinois River from all tributary streams, quickly settle and obstruct the channel. Though four locks and dams have been built, two by the State and two by the Nation, to improve navigation; and though during the past eight years the low-water flow at Utica has been increased nine-fold by water from Lake Michigan, yet last fall the one little packet boat ("The Bald Eagle") which makes regular trips between St. Louis and Peoria, was much impeded because, when loaded to barely four feet draft, she scraped the bottom at several places.

The authors of the pamphlet that we are considering criticise the scheme of the Army Engineers for obtaining a fourteen-foot depth between Utica and Grafton. One objection offered is that the official plan proposes to place the flow line for this portion of the river too high. Such higher flow line would leave Chicago in the undesirable position of having to pay for the damages that would result from the increased flow of 4,167 or 10,000 or 14,000 cubic feet per second, which General Marshall says would damage from 100,000 to 300,000 acres of bottom lands, a portion of which the Chief Engineer estimates as being worth from $100.00 to $150.00 per acre. No wonder, then, that the Chicago engineers, who built the Drainage Canal, made the estimates of cost for the extension from Joliet to Utica which we have before considered, and prepared the pamphlet that we are now discussing, should urge that the flow line be placed ten feet lower at Utica than the Army Engineers proposed.

The authors of the interesting pamphlet assume that the National Government will do the required dredging, **which will be vastly increased if the plans of the Army Engineers be turned down,** and that the people of the Nation will pay the cost. Certainly this would be far pleasanter, from the viewpoint of these distinguished Chicago engineers, than the plan proposed by the United States Army Engineers, who are always loyal to the Nation that they serve with admirable faithfulness and efficiency.

The army engineers estimated for dredging 27,867,060 cubic yards in order to secure a fourteen-foot channel, assuming that 10,000 cubic feet, per second, of water will be drawn from Lake Michigan.

The Chicago engineers, advocating a flow line ten feet lower at Utica, say: "In fact, a preliminary estimate shows 190,000,000 cubic yards in a channel of eighteen feet, 330 feet wide on bottom and with side slopes of two and one-half to one." What would it be for twenty-four feet? That is the goal sought.

In supporting their contentions, the erudite Chicago engineers gravely assure us that the engineers of the Army Corps erred in supposing that economy would require that no greater alteration be made in existing flood conditions than are necessary in order to secure the desired results. They state that, on the contrary, the conditions **"should be disturbed as much as possible."** Instead of dredging about 28,000,000 cubic yards from the channel, they advocate dredging 400,-000,000 from the river and its tributaries.

They proceed to hint darkly, but solemnly, at putting a similar policy into effect, in treating the "Father of Waters," between Grafton and St. Louis, and, instead of making it navigable as the army engineers had proposed, they suggest changing the pesky little thing altogether. They say, "Any radical change in flood conditions at the mouth (of the Illinois) involves a heroic undertaking, nothing less than a change in the course of the Mississippi, and, possibly, of the Missouri." They leave us in painful uncertainty as to what this portends. Do they think of modifying the regimen of the Upper Mississippi by reversing its flow also? Turning it back through the St. Croix into Lake Superior, so as to remove the objection to taking water from the lakes for the Sanitary Canal? We cannot tell. The theory enunciated is startling, but clever, and indicates originality of conception and fearlessness in promotion. It is tantamount to saying, "If you wish to economize, squander your resources"—really that seems the soul of the whole waterways agitation, but the Chicago engineers are the gifted individuals who were first to express the theory in epigrammatic form.

Another application of the same general theory might be expressed in the words, "If you wish to enjoy a 'feast of reason,' go to a lunatic asylum, or attend an Inland Waterways Convention."

It will be observed that the present difference in low water level between Utica and Grafton is only twenty-seven feet. Should the channel be dredged to twenty-four-foot depth at Utica, its bottom would be only three feet higher than the surface of low water in the Missis-

sippi at Grafton, 229 miles distant. Into this big ditch with its sluggish current, empty innumerable small and large tributaries, flowing, with rapid currents, from the rich, cultivated agricultural regions adjacent to the river valley. When these torrents, laden with mud, sand, and gravel, should reach the artificial ditch, they must quickly deposit their load of sediment in its bottom. If the artificial ditch twenty-four feet deep, be excavated square across the mouths of tributary branches and rivers, that are only from one to ten feet deep, tremendous quantities of mud and gravel must begin to wash into the deeper channel at once. Evidently it would be necessary to excavate the channels of all the tributaries, for long distances back from the main channel. This might involve as much dredging as the main channel, which we are advised would require 190,000,000 cubic yards, for an eighteen-foot depth. Certainly, then, it is not excessive to estimate for 400,000,000 cubic yards dredging in order to secure a twenty-four-foot channel from Utica to Grafton. To quote Mr. Roosevelt again, this is "about twice the amount of material to be excavated in opening the Panama Canal." Mr. Roosevelt was talking about tons, whilst we are using as our unit cubic yards, and a cubic yard would probably weigh about 1.4 tons. In fact, the amount of material to be moved might be found to be from seven to eight hundred million tons to a billion tons. We cannot even guess at the cost of removing the millions of cubic yards that would be washed into the channel by tributary streams, or that would slough from the banks each year.

Verily this would be "disturbing existing conditions" with a vengeance, but still "not as much as possible." The utmost possible disturbance that we can think of would be to build a Leighton-Roosevelt dam above Grafton—high enough to turn the whole Illinois River drainage back into Lake Michigan. That arrangement would not produce any water power, but it might drown Chicago, and wholly eliminate all the botheration about sanitation, navigation, and conservation in that portion of the Mississippi Basin.

On the whole, it seems probable, however, that the people of the Nation, if given a hearing, will prefer the plan proposed by the Chief Engineer of the Army to that advocated by the Chicago engineers, even though they might sympathize with the citizens of Chicago, when they are required to pay damages on from 100,000 to 300,000 acres of land worth from $100 to $200 per acre.

In the pamphlet prepared by the Chicago engineers, we find some more "Deep Waterways Dope" presented in more seductive form than

the musical "dope" that was offered to Ulysses by the sirens of old. Thus, the water power to be developed above Utica is estimated to be 173,000 horse-power. We quote:

"The water power should have a development value of $200.00 per horse-power, or $34,600,000. Its ultimate value should be double, or $69,200,000. It may represent in itself and in collateral plants an investment of $1,000 per horse-power as in older countries, and it may produce taxable wealth to three or four times such amount."

Let us see: 173,000 horse-power worth $1,000 would be $173,000,000, and four times that is $692,000,000 for horse-power.

LOCK AND DAM, ILLINOIS RIVER, HENRY, ILL.

Plans for the "Deep Waterway" contemplate the removal of this lock and dam.

We quote estimates as to the "fish crop" from lands to be overflowed as follows: "It is not too much to expect that this crop will increase to a value of $15.00 to $20.00 per acre in the future, or amount to $1,200,000 to $1,600,000 annually."

This "fish story" gives (if capitalized at 4 per cent) a value of $40,000,000.

We quote again:

"The 220,000 acres in marginal low lands and under ordinary floods, ought to be worth $5.00 per acre per year under systematic forestry. Low land timber reproduces rapidly and is now valuable, and will become more valuable in the future. An annual crop of $1,100,000 from such a source is not to be depreciated."

One million one hundred thousand dollars capitalized at four per cent, gives a value of $27,500,000. These estimates aggregate the stupendous sum of $760,600,000 and probably leave the authors of our pamphlet a clear lead in the race for the prize of the high calling of the imaginative waterways advocates. Poor Mr. Leighton and the Inland Waterways Commission are thrown entirely into the shade. They had the whole Ohio River watershed to deal with, and succeeded in producing only a tremendous amount of mud and foolishness; whilst these poetic Chicago engineers have, without half trying, produced $760,600,000 worth of power, "dope," bait, "suckers," water birch and weeping willow, from diluted Chicago sewage flowing through the little Illinois River Valley. When I made a trip along the Illinois River in the summer of 1908, I saw thousands of acres of submerged land, covered with standing dead timber. I asked the cause of the devastation and was told that it was attributed to the water from Lake Michigan, which had flooded the bottoms. Perhaps Nature had made a mistake in selecting species of trees adapted to the conditions in the lakes and our Chicago engineers may import an aquatic growth that will produce a revenue of $1,100,000 per annum.

We would suggest experiments with water-cress and bull-rushes, or an experiment with a "Goose Farm." The following **prospectus,** loaned us by a friend, and for which we claim no credit, might be helpful; it being assumed that our Chicago engineers and boomers would go into the goose business on a vastly greater scale than was contemplated by the modest author of the prospectus.

Prospectus for a Goose Farm.

Number of stockholders	three	
Shares of stock—three at $100 par value—	$300.00	
300 geese at $1.00 each	300.00	
Three eggs per week per goose	900 eggs per week	
900 x 52 equals	46,800 eggs per year	
46,800 x 3 equals	140,400 eggs per three years	
No eggs sold, but all incubated and hatched; allowing for bad eggs, 40,400, leaves	100,000 geese	
Two lbs. feathers per goose	200,000 lbs.	
$1.50 per lb., for feathers		$300,000
100,000 pair goose livers at 60c per pair		60,000
Ten buttons from each goose bill, 2,000,000—1 cent each button		20,000

$1.50 per goose dressed	150,000
Capital invested	300
Estimated operating expenses	190,000.00
Total	$190,300.00

Receipts.

Feathers	$300,000.00
Goose livers	60,000.00
Buttons	20,000.00
Dressed geese	150,000.00
Total receipts	$530,000.00
Expenditures	190,300.00
Net profits	$339,700.00
Each stockholder	$113,233.33
Annual dividends	37,744 per cent

One is astonished to find that among the men who prepared this Munchausen-like report there were two distinguished engineers, and that the Governor of the great State of Illinois actually sent it to the Legislature with a message of strong commendation. It has long been known that certain liquids produced in Kentucky tend to "steal away men's reason" but only in the past few years has this Nation produced multitudes of men upon whose weak brains **water** can have the same effect.

(5) Fourteen-Foot Waterway Between the Mouth of the Illinois River (Grafton) and St. Louis Harbor—Thirty-Eight Miles.

The Mississippi River Commission reported to the Chief of Engineers on February 28, 1905 (see House Document No. 263, 59th Congress, 1st Session) that the portion of the Mississippi River between Grafton and St. Louis can be improved to a fourteen-foot depth at a cost of $6,553,880.

The Commission expresses doubt as to the practicability of maintaining a fourteen-foot depth in the channel of the Mississippi River, between Grafton and St. Louis, by reason of the currents and silt deposits—caused by the Missouri River which empties into the Mississippi between the two cities and a short distance below Alton. It is proposed to construct a dam, on a pile foundation, across the

Mississippi River just below the Burlington Bridge at Alton. The dam (it is stated) would be 2,500 feet long and of the Chanoine wicket type, which can be raised when needed to secure the desired depth, and lowered when not required. The dam would be eighteen feet high and would pool the water from Alton to Grafton so that, with some dredging, there would always be at least fourteen feet depth in the navigated channel.

The proposed canal would be about eighteen miles long, 160 feet wide at bottom, and fourteen feet deep. The lock at the lower end of the canal, would have a lift of thirty (30) feet and have dimensions of eighty feet by 600 feet. It seems noteworthy that this arrangement would not materially benefit navigation on the Upper Mississippi, where improvement schemes contemplate a depth of only six (6) feet (which is estimated to cost $20,000,000 between St. Paul and the mouth of the Missouri River).

In order to give a constant stage of fourteen feet between Alton and the mouth of the Illinois River, it would be necessary to keep the dam at Alton up from six to eight months in every year. This would close open-river navigation on the Mississippi River, above St. Louis, for all packet boats, barges, pleasure boats, timber rafts, etc., for at least six months in the year. All such craft would be forced to use a lock with a lift of thirty feet and proceed eighteen miles through a narrow canal. The speed through the canal (which is planned to be carried between earth embankments or in earth excavation for practically its whole length) would of necessity be limited to about five (5) miles per hour. The proposed canal is to be on the Illinois side of the river. Packet boats coming out of the Missouri River, bound for points on the upper Mississippi, and boats handling local traffic between St. Louis and points along the bank, between that city and Alton, would, for from six to eight months in each year, be greatly inconvenienced, and lose much time on account of the necessity for going down to St. Louis in order to enter the canal, through a high lift lock, before proceeding on a journey to towns along the Mississippi River above Alton.

Traffic coming down the Mississippi, bound for points on the Missouri River, or with goods for points on the Mississippi, between St. Louis and Alton, would be subjected to still greater delay and inconvenience. The commerce on the upper Mississippi that would derive no benefit from the "improvement" under discussion but would, on the contrary, be greatly delayed and inconvenienced by it, during at

least six months in every year, is small but about a hundred fold greater than the traffic on the Illinois River, for the benefit of which the "improvement" is designed.

We have no means of judging as to the accuracy or reliability of the estimate of cost (see pages 542 to 544 of House Document No. 263, 59th Congress, 1st Session) for the fourteen-foot scheme, between Grafton and St. Louis, but the work of the army engineers is usually very thorough. We note, in passing, that the canal would cut off from the mainland of the "French Bottoms" a tract of land having an area of about 17,920 acres, leaving it in such shape that it would not be worth levee protection and would be inaccessible from the mainland, except by means of draw-bridges, crossing the canal. It is probable that the owners of this land would claim damage, to the full value of the property. The estimates for the canal include 1,550 acres of land at $300 per acre. If the owners of the strip of ground, which would be isolated, should succeed in convincing assessors that their land had been ruined, by the canal, we should have, at once, an additional item of expense of $5,376,000. This estimate of land damage is probably much too high, but there is little room for doubt that the actual cost of the scheme, estimated at $6,553,880, would be over $10,000,000. Should twenty-four-foot depth, between Grafton and St. Louis, be sought, the cost would probably be from thirty-five to fifty millions.

Chapter XVI.

MISSISSIPPI RIVER—ST. LOUIS TO THE GULF.

"The reach from St. Louis to Cairo, a distance of 180 miles, presents greater difficulties in the development of a deep waterway than and (other) portion of the route from the Lakes to the Gulf, and the best course to pursue has not yet been fully determined."—J. A. Ockerson, Member Mississippi River Commission. In a paper read before the Engineer's Club of St. Louis, February 5, 1908.

St. Louis to the Mouth of the Ohio.

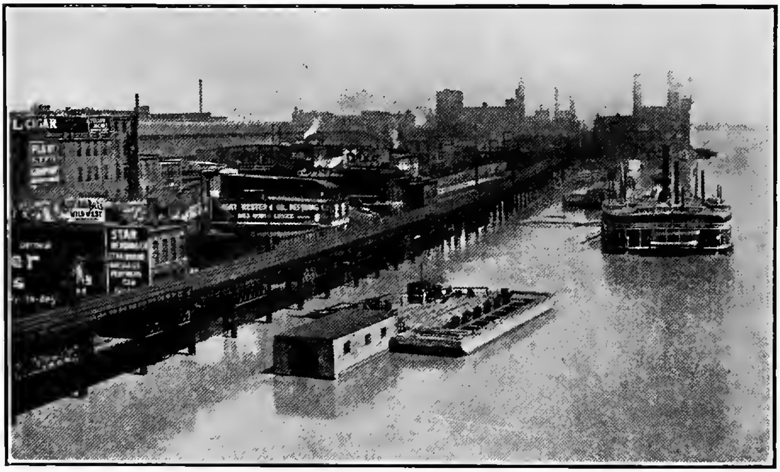
The reports of the Mississippi River Commission show that it will be more difficult to obtain a permanent fourteen-foot depth of water between St. Louis and Cairo than in any other portion of the Mississippi River, and no scheme has yet been recommended by the Chief of Engineers.

The Government has already expended $14,591,335.51 on this portion of the river, and, for many years previous to the fall of the year 1908, a channel depth of eight feet had been maintained. During that year, however, the water was much lower than usual, and the dredging system failed to maintain more than six feet in the channel. There are no boats running here that draw as much as eight feet of water, and it is probable that there never will be again.

Though an eight-foot depth was obtained and maintained for several years, at great cost, the traffic on this portion of the river declined steadily. In 1901, the commerce was 563,848 tons, whilst in 1907 it had declined to 332,267 tons, in spite of the fact that the general business of the country increased enormously during the period 1900-1907. In 1880 the total river traffic at the port of St. Louis was 2,130,525 tons. The channel was then obstructed and shallow. Since then about fourteen million dollars have been expended on the improvement of the river, and yet the total commerce of the port of St. Louis in 1908 was only 370,425 tons. During this period the population of St. Louis has increased from 350,518 to about 700,000. The aggregate population of the two States, between which this

portion of the river flows (Missouri and Illinois) has grown from 5.246,251 to about 10,000,000, and the transportation business of the region has increased at a still more rapid rate.

The extreme low water flow of the Mississippi River at St. Louis is only 24,000 cubic feet per second. This has been augmented somewhat since 4,167 cubic feet per second from Lake Michigan was added, though most of that is probably lost during the season when it is most needed, by evaporation and absorption, in the 365 miles between Chicago and St. Louis. Ninety-six billion cubic feet of water from reservoirs at the head of the Mississippi River fail to show any effect on the stage of water below Lake Pepin, which is over 500 miles above St. Louis. It is, therefore, certain that no appreciable



ST. LOUIS LEVEE DURING HIGH WATER.
Looking North from Eads Bridge.

benefit can ever be obtained below St. Louis from such small additions to the capacity of those reservoirs as may be found expedient.

The slope of the Mississippi River between St. Louis and Cairo is 109 feet, an average of about 0.6 feet per mile. The width of the river in this reach has been known to vary, during low water periods, from 600 feet to 4,000 feet, and from 1,550 feet to 6,800 feet at bank-full stages—in extreme high water it is frequently many miles wide

Much difference of opinion has existed, among able engineers, both in the army establishment and in civil life, as to the possibility,

practicability and desirability of deepening this portion of the Mississippi.

In the year 1907, Congress provided, in the Rivers and Harbors Bill, for a survey and report on the much discussed Lakes-to-the-Gulf Deep Waterway. This led to the appointment of a Board of Engineers, consisting of three members of the Mississippi River Commission and three officers of the Corps of Engineers of the United States Army. Col. Wm. H. Bixby, President of the Mississippi River Commission, is at the head of this Board, and he and his associates are considered to be among the ablest engineers in America. The "Deep Waterway Board," most of the members of which have been in active charge of waterway improvement work for many years, and are probably as familiar with every phase of such work as any other men in the world, devoted about two years to most careful examinations and surveys and, on March 20, 1909, made a report to General Marshall, Chief of Engineers of the United States Army. This report was examined by the General Board of Engineers for Rivers and Harbors, who concurred in the opinions expressed, except as to a few matters of detail in which the general public is not interested. Finally General Marshall reviewed the report and approved it, except as to one important question and as to certain minor details in which non-technical people would probably feel little interest.

The original board reported "That to provide an effective navigation in the swift currents of the Mississippi will require a channel width of not less than 500 feet, and that it is possible to accomplish this, between St. Louis and Cairo, by any one of six different methods of procedure, viz:

(1) By dredging, requiring $6,000,000 investment in plant, and an annual expenditure of $2,000,000 for operating and maintaining the plant.

(2) By regularization, at estimated cost of $53,216,480, and an annual cost of $500,000 for maintenance.

(3) By canalization, with movable dams, at a cost of $25,000,000, and an annual maintenance expense of $400,000.

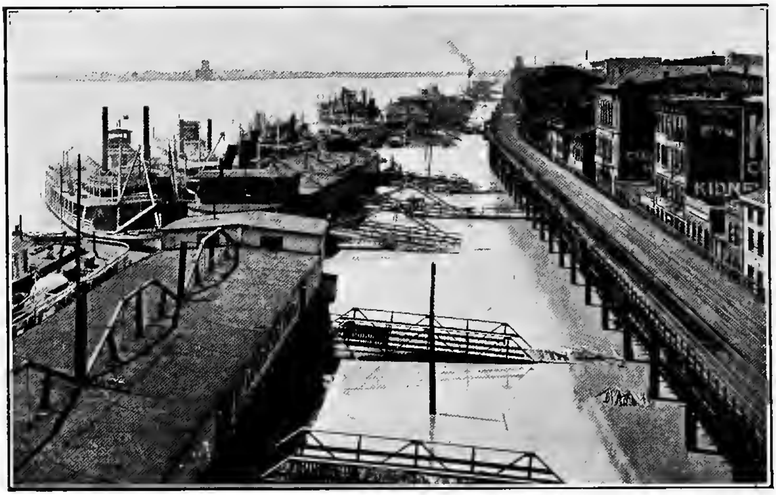
(4) By canalization, with fixed dams—cost pronounced prohibitive, and no estimate submitted.

(5) By a lateral canal or canals—cost from $102,000,000 for a single continuous canal with $600,000 annual cost of operation and maintenance to $36,000,000 first cost, and $450,000 annual expenditure,

for short canals connecting pools now having constantly the required depth.

(6) By an "open-river improvement" combination of methods, including an estimated cost of $21,000,000 for completing the "original project," and investment of $3,600,000 in dredges with a subsequent maintenance charge of $1,500,000 per annum.

After a careful comparison of the merits of these several propositions the Board concludes that the last one mentioned is the most meritorious.



ST. LOUIS LEVEE DURING HIGH WATER.
Looking South from Eads Bridge.

We have, then, from the highest possible authority, an estimated cost of $24,600,000 as the necessary capital investment, in order to secure a fourteen-foot channel from St. Louis to Cairo, and, subsequently, an annual maintenance cost of $1,500,000.

The Board then discusses the "desirability of a fourteen-foot waterway," and shows up the absurdity of the proposition, concluding that part of the discussion as follows: "The Board is of the opinion that a fourteen-foot waterway is suitable for neither existing lake nor ocean vessels; that freight moving on Lake or Gulf will require transshipment to vessels adapted to its navigation, and that its principal value will be to provide for commerce that originates along its banks or those of its tributaries, until the introduction of some form of

vessel adapted to all forms of navigation. There will then be an immediate demand for a channel of greater depth than fourteen feet."

With the completion of the work at the estimated cost above set forth, there would be a fourteen-foot channel with water so swift that its navigation by steamboats and barges would be attended with difficulty. Its navigation by sea-going vessels would probably be economically impracticable, and besides, it is found that vessels drawing fourteen feet, when loaded, are no longer used, either on the lakes or the ocean—having been superseded by much larger craft.

There are now two practically level railroads, one along each side of this portion of the Mississippi River, and the railroad tariffs are exactly the same as the water rates. Both of the railroads are hungrily seeking an increase of tonnage.

Taking the estimate of the Board as the basis of our calculations, we have the following figures:

Proposed investment, $24,600,000, at 4 per cent per annum.	$984,000.00
Estimated annual cost of care and maintenance	1,500,000.00
Annual cost to people of the Nation...............	$2,484,000.00

The total commerce of the river between Cairo and St. Louis, during the year 1907, was 332,267 tons, of which 166,360 tons was coal and coke from the Ohio River, going to St. Louis, and 20,572 tons of grain and iron, which probably traveled the whole distance between the two cities. The balance of the tonnage—145,336 tons—was general freight, moving from St. Louis and Cairo to intermediate villages and farms, and return cargoes. This tonnage probably moved about half of the distance between the two cities, or about ninety-four miles. We have, then:

166,360 tons of coal and coke hauled 188 miles....	31,275,680 ton-miles
20,571 tons of grain and iron hauled 188 miles....	3,867,348 ton-miles
145,336 tons of mixed freight hauled 94 miles....	13,661,584 ton-miles
Total	48,804,612 ton-miles

This figure shows the probable total commerce of this portion of the river for the year 1907.

The estimates of annual cost used above are based on the plan for improvement that is considered most feasible by the Deep

Waterways Board, and by the Board of Review. It should be noted, however, that the Chief of Engineers, in reviewing the reports of his subordinates, says of this scheme: "Nor is the Chief of Engineers prepared to recommend that it is practicable, from an engineering standpoint, to secure and maintain a fourteen-foot depth at low water in the section from St. Louis to the mouth of the Ohio River, by any method of open-river improvement." If General Marshall's doubts as to the feasibility of accomplishing the desired results by the "open-river improvement" method be well founded, there would seem but one reasonable alternative—a lateral canal, costing $102,000,000 for construction and $600,000 for annual maintenance and operation. The Board expressed the opinion that this plan would be "altogether too costly" (which is evidently equally true of any conceivable plan), whilst to all the other suggested schemes objections of a fundamental character are opposed.

If the canal should be built, the annual costs would be as follows:

Interest on investment ($102,000,000) at 4 per cent, per annum	$4,080,000.00
Annual cost of maintenance and operation	600,000.00
Annual cost to the people of the Nation	$4,680,000.00

It has been shown that the commerce of this section of the river has been steadily and rapidly declining, ever since railroads were built in the valley. It has also been shown that the immense expenditures proposed would not tend to increase the traffic. The two practically level railroads now paralleling the river closely, are constantly improving their roadbed and introducing more powerful engines and larger cars. They are also constantly improving discipline and perfecting organization, and all these changes enable them to render better and quicker service, whilst gradually reducing their tariff charges.

The boats now charge precisely the same rates that the railroads charge. They are, for the most part, in the last stage of decline—old, shabby, dirty, and vainly struggling to earn a living revenue at the rates at which the railroads are hauling the same products at some profit. The railroads are paying immense sums in taxes to the State, whilst money invested in the river improvement is a dead loss. The railroads are paying to hundreds of citizens of the Nation interest

on the capital invested in their railroads and rolling stock, and thus putting into circulation large sums of money that add to the business prosperity of the Nation, whilst money invested in the river improvement pays neither interest nor dividends.

The figures given above show the ton-mileage of traffic for the year 1907, and the estimated cost, per annum, to the people of the Nation for the proposed waterway. These figures give, for the "open-river improvement scheme" a cost of 5.1 cents per ton-mile—nearly seven times the average cost of railroad freight transportation in this country, and twenty-five times the rate at which coal is hauled on the Chesapeake & Ohio Railroad.

If the lateral canal be finally adjudged the most feasible scheme for improvement, the ton-mile cost will be 9.6 cents. This is twelve times the average rail rate, and fifty-two times the rail rate on coal on the Chesapeake & Ohio Railroad.

It should be remembered that this $2,484,000.00 or $4,680,000.00 per annum will be practically a total loss, since the boat and rail rates are now the same, and any small reduction in cost of river traffic will certainly have been more than met by reductions in cost of rail transportation, long before the river improvements can be made effective.

The utter absurdity of entering upon the waterway improvement is more forcibly impressed upon the mind, when it is realized that the annual expenditure of the lesser sum ($2,484,000.00) in maintaining the waterway, which would benefit no one, would pay the freight charges, at average railroad rates (0.76 cents) on the whole volume of traffic now moved on the river (332,267 tons) for the entire distance between St. Louis and Cairo (152 miles by rail), and leave an annual surplus of $2,100,165.16, and that each three years' accumulation of this saving would build a first-class modern railroad, costing over $40,000 per mile, for a distance as great as that between St. Louis and Cairo.

It should be noted that of the total commerce of this reach of the river for the year 1907, 31,275,680 ton-miles, or sixty-four per cent, was coal and coke, coming out of the Ohio River. It is proposed to give the Ohio River a depth of only nine feet. If the Mississippi were deepened to fourteen feet, the tonnage coming from the Ohio, and constituting sixty-four per cent of the entire commerce on this section of the river, would derive no kind of benefit, since it is, and must always be, borne in barges drawing only eight feet of water.

When we consider that sixty-four per cent of the commerce is coal and coke, moving up the river; that probably twenty per cent is general merchandise, farm products, etc., also moving up the river; that boats going up the streams can average a speed of only about five miles per hour, whilst trains on the railroads move over a much shorter route at rates of speed from five to ten times as rapid; that this portion of the river is frequently closed by ice—sometimes as much as sixty days continuously, whilst the railroads work on, day and night, unceasingly; that, during periods of extreme high water it is difficult or impracticable to load or unload boats at the St. Louis wharves and landings, whilst the trains may be loaded and unloaded day and night at all seasons; that both at St. Louis and at Cairo it is wholly impracticable to arrange for transferring tonnage between the boats on the ever fluctuating river and factories, warehouses and wholesale stores in the cities, except by means of drays and wagons, with resulting delays and damages to goods, whilst the railroads have spur lines reaching nearly all such establishments, on which they can quickly place cars to be loaded or unloaded; that the dangers of the river traffic are so great that heavy insurance rates must be paid on water shipments, whilst no such charges are ordinarily assessed against the rail traffic; when we consider all these things, the utter folly and madness of the men who continue to advocate immense bond issues for these preposterous waterway expenditures, become more and more astounding and incomprehensible.

The whole proposition is a gross insult to the intelligence of the American people.

Cairo to the Mouth of Red River—762 Miles.

The low-water flow of the Mississippi River, below the mouth of the Ohio at Cairo, is about 80,000 cubic feet per second, and the average slope below Cairo is only about 0.3 feet per mile. It is, therefore, doubtless possible to maintain a channel fourteen feet deep and twenty-five feet wide by using hydraulic dredges. It would seem impracticable to maintain a twenty-four-foot channel, in the river, by any conceivable method.

The National Government had expended on the Mississippi River between Cairo and New Orleans, $50,730,614.84 previous to July, 1907. The Congress made an appropriation of $3,000,000, "by the River and Harbor Act, approved March 2, 1907, for improving the Mississippi

River from the head of the Passes to the mouth of the Ohio River." The same act "authorized the letting of contracts to the extent of $6,000,000 in addition to the amount appropriated by the act. This sum to be used in prosecuting the improvement for not less than three years, beginning July 1, 1908." (See Report of Mississippi River Commission for 1907.)

In the year 1907, the traffic between Cairo and Memphis had declined to 1,835,746 tons. Of this 1,031,154 tons (fifty-six per cent) was coal and coke, nearly all of which was owned by the Monongahela River Consolidated Coal & Coke Company, which company is owned by the Pittsburg Coal Company. The Pittsburg Coal Company was incorporated in New Jersoy, in 1897, and is capitalized at $64,000,000. It handles about seventy-eight per cent of the coal traffic on the Ohio River. The canalization scheme, now in progress on the Ohio River, contemplates a depth of only nine feet. The barges of the Monongahela River Consolidated Coal & Coke Company, and other coal corporations, carrying fifty-six per cent of all traffic between Cairo and Memphis, can never be loaded to draw more than eight and one-half feet of water, because they must first float 965 miles, from Pittsburg to Cairo, through the Ohio River, before they reach the Mississippi. A large part of the remaining forty-four per cent of the traffic on this section of the river is carried in packet boats, drawing from three to eight feet of water when fully loaded. There is, therefore, very little traffic on the Mississippi River, between Cairo and Memphis, that can be benefited in the slightest degree by deepening the channel to fourteen feet.

The percentage of traffic on the Mississippi to be credited to the Monongahela River Consolidated Coal & Coke Company for various reaches of the river, gradually diminishes descending the stream, because a portion of that tonnage stops at Memphis; a portion at Vicksburg and another portion at Natchez. On the other hand, the quantity of miscellaneous river freight gradually increases, owing to the fact that the railroads have not yet closely paralleled the river in its lower reaches, except between Baton Rouge and New Orleans.

The absence of modern transportation facilities greatly hampers the development of the region, but before the persecution of the railroads began, lines were being gradually extended parallel with the stream, with spurs reaching the villages and plantations. Doubtless this work will be resumed when the demagogues have been disposed of, and the commissions emasculated or their members assigned to

other jobs, in which they may feed at the public crib without retarding the progress of civilization or preventing the development of the latent wealth of the national domain.

There are no manufacturing towns and no mines between Memphis and New Orleans (736 miles) and the total population for the river towns was only 50,431, by the census of 1900. This accounts for the fact, above mentioned, that this portion of the river has not yet been closely paralleled by railroads, and the people in the villages and on the plantations, particularly in the big bends, are compelled to depend

MISSISSIPPI RIVER IN A TIME OF EXTREME HIGH WATER.
Negroes seeking refuge upon the levee.
(From "The World To-day"—Issue of March, 1907.)

on the primitive water transportation, with its intolerable delays and inconveniences.

The packet-boat business must gradually decline as railroads are built closer to the river and branch lines are extended into the bends.

The coal trade cannot grow much, because as the Board of Engineers for Rivers and Harbors reported, in October, 1907: "It is believed that as much coal is now shipped by water as there is a demand for on the lower rivers." It must cease altogether when the

little coal territory, principally in Pennsylvania and West Virginia, now tributary to the Ohio River, has been exhausted.

One hesitates to make any forecast as to the future of the "commerce" handled by the Government fleet of boats. The Mississippi River Commission, acting under orders from the Congress, is earnestly endeavoring to expend $2,000,000 per annum, in addition to ordinary annual appropriations, between Cairo and New Orleans and is doubtless succeeding admirably. One sees many Government house-boats and gaily decked launches, also great numbers of scows, sand barges and hydraulic dredges between Cairo and New Orleans, doing nothing about seven months in the year, and strenuously pumping mud from one part of the river bed into another part, during the balance of the time. There seems no limit to the possible expenditure in this line, since the excavated channel quickly refills to its original condition as soon as the water rises a few feet, and thus the mud may be rehandled **ad infinitum.** This work affords employment to quite a number of voters during eight hours a day, and for six days a week (if there be no election day or other holidays intervening) for four or five months of every year. It also results in distributing through the river country considerable sums of money. The dredging does not seriously interfere with navigation, since there is practically no navigation in progress during the season of the year in which that altruistic work is in progress.

It is certain that the work does not injure the river, and that it pleases many people who can vote.

In the year 1907, the United States Government had on the Mississippi River eighty-nine boats of various classes, not including barges, scows and smaller craft.

One cannot foretell the future extent of this interesting and benevolent "muck raking and mud slinging" by hydraulic dredges. Perhaps the demagogues may become envious and try to put their powerful mechanical rivals out of commission.

It is impossible to say, with certainty, what the cost of maintaining a fourteen-foot channel, below Cairo, would be. The stage of the river is never the same during any two successive years. For several years, previous to 1908, there had been more water during the drought season than had been noted in a previous period of many years. The lowest water at Memphis in 1895 was 6.14 feet lower than the average of the lowest water stages at the same point for the years 1898, 1900, 1901, 1902, 1903, 1904, 1905 and 1906. (This is

rather confusing to the conservation "scientists" who tell us that the rivers are being dried up, in the summer and fall, by reason of the rapid diminution in forest area.)

The report of the Deep Waterways Board, from which we have been quoting, states that it is estimated that the cost of obtaining and maintaining a fourteen-foot channel below Cairo will be $104,000,000.00 investment, with a subsequent annual cost of $5,000,000 for maintenance. This is made up of a suggested expenditure of $95,000,000 for bank protection, to prevent the caving banks from throwing about one billion cubic yards of material into the river annually, as has been its custom heretofore; an investment of $9,000,000 in hydraulic dredges to be used in maintaining the channel through the sand-bars and "crossings," and an annual expenditure of $5,000,000 for maintaining the revetment work and operating the dredges. The annual costs for a fourteen-foot waterway would, based upon the above estimates, be as follows:

Interest on investment ($104,000,000) at four per cent...	$4,160,000.00
Annual cost of operation and maintenance..............	5,000,000.00
Total annual cost to the people of the Nation......	$9,160,000.00

The Board expresses the opinion that, owing to the swift current at many places, it will be impossible to navigate a channel less than 500 feet wide. That width must, therefore, be substituted for the 250 feet heretofore proposed.

Even with reference to a 500-foot channel the Board is of the opinion that neither the lake nor ocean vessels, now in existence, could navigate the crooked and swift Mississippi. We quote: "A modern lake freighter, moreover, is poorly constructed for navigating a tortuous river with a swift current. The ratio of length to beam is too great, and the rudder power insufficient. The Board is of opinion that a fourteen-foot waterway is suitable for neither existing lake nor ocean vessels."

It is a well known fact, which we have already mentioned, that many large ships have gone ashore in the short length of the Eads jetties at the mouth of the Mississippi River, because of the slight current there. The total fall between New Orleans and the Gulf, at extreme high water, never exceeds one-tenth of a foot per mile; whilst at low water periods there is so little slope that the eighteen inches

of Gulf tidal rise and fall affect the stage of water at New Orleans. The average slope of the Mississippi, between Cairo and the mouth of Red River, is three-tenths of a foot, per mile. It is evident, therefore, that the opinion of the Engineers of the Board is fully justified.

Is it not preposterous, then, to talk about a twenty-four-foot depth, or about making the Mississippi "a loop of the sea," for the use of war vessels drawing from eighteen to twenty-six feet of water?

It has been shown that the coal and coke traffic originating on the Ohio River cannot be benefited by improving the Mississippi to a greater depth than nine feet.

It is manifest that the small amount of traffic still handled by the packet boats, none of which draw more than five to eight feet of water, cannot be benefited in the slightest degree by increasing the depth to more than nine feet.

There remains a small tonnage in "lumber, logs, iron, steel and metals, stone, sand and gravel," which might (?) be transported at less cost if boats or barges of greater tonnage capacity could be used. During the year 1907, the aggregate amount of such tonnage between Cairo and Memphis was 663,205; between Memphis and Vicksburg it was 604,285, and between Vicksburg and New Orleans it was 1,139,816. The reports of the Chief of Engineers give no data from which one may determine how far this tonnage was carried. It seems reasonable to assume that the "iron, steel and metals" were carried the entire distance between cities mentioned, but it would be manifestly absurd to assume that the logs and lumber or the "stone, sand and gravel" traveled from one city to another, since such substances do not originate in cities. It seems reasonable to suppose that most of the logs and lumber originated in tributary streams and were floated on the Mississippi from the mouths of such tributaries to the saw mill sites, or to the nearest cities, or to the nearest accessible railroad. It seems also probable that the "stone, sand, and gravel" traveled only short distances from quarries, sand-bars or gravel-pits to nearby towns, cities, Government "improvement" works or to accessible points on railroads, for their use as ballast. Large quantities of gravel are annually taken from the bed of the river just below the mouth of Red River, and used by the railroads for ballast.

Owing to lack of definite knowledge, we will assume that in each instance the "iron, steel and metal" passed over the whole distance between the two cities, and that the "lumber and logs" and the

"stone, sand and gravel" were borne half of the distance from one of the cities to the other.

This gives a ton-mileage that might (?) have been benefited by deeper water and larger barges, as follows:

Between Cairo and Memphis	82,805,635	ton-miles
Between Memphis and Vicksburg	120,035,585	ton-miles
Between Vicksburg and New Orleans	175,510,347	ton-miles
Total ton-mileage benefited	378,351,567	

According to Major Sibert's computations, this tonnage, borne in barges that could be handled on the nine-foot improved Ohio, might be handled between Cairo and New Orleans on a nine-foot channel at a cost of .039 cents per ton-mile, or a total cost of $154,557.11. We have no experience to guide in determining wnat the cost would be in barges that might be used on a fourteen-foot channel, but if such larger bottoms could reduce the cost by one-half, the total saving would be only $77,278.56 per annum, as the result of an expenditure of $9,160,000.00. Is it possible to conceive of a more irrational or idiotic proposition?

The scheme of operations proposed by the Board of Engineers seems manifestly the only method by which it would be possible to secure and maintain a fourteen-foot channel, in the Mississippi River below Cairo, but the cost is wholly out of all proportion to any possible resulting benefits to navigation interests on the river. The General Board of Engineers for Rivers and Harbors further states, "It is not desirable to construct a navigable channel fourteen feet deep, from St. Louis to the mouth of the Mississippi River, or from Chicago to the mouth of the Mississippi River. Such a depth is greater than required for successful river navigation, and is less than required for economic lake or ocean navigation. Present demands of commerce between St. Louis and the mouth of the Mississippi River are adequately met by existing projects having for their object to obtain and maintain an eight-foot channel from St. Louis to the mouth of the Ohio, and a channel of not less than nine feet in depth, below the mouth of the Ohio."

We have in a previous chapter discussed, at some length, the sophistries indulged in by our waterways agitators, in insisting that we should spend vast sums on the improvement of our rivers, because

unwise restrictive legislation has forced a large tonnage of commerce to use the crooked rivers and long, circuitous water routes of transportation in some European countries. In that connection the report of the Deep Waterways Board says: "The existing improved waterway of the Mississippi River, below St. Louis, fully equals, and over the greater part of its extent, far excels, in depth and duration of unobstructed use, the existing river systems of Europe, where the non-tidal sections are usually given—depths of only three to nine feet, nine feet being exceptional."

"The immense commerce of the Rhine could be carried more readily and cheaply on the Mississippi to-day, than on the Rhine, if such commerce were available for transportation by water, and demanded such transportation."

"The decline in the commerce of the river has not arisen from its lack of navigability, but from the reduction in amount of material available for shipment"—because the shippers have availed themselves of the superior facilities, shorter routes, and lower costs offered by the railroads.

We have seen that between New Orleans and Baton Rouge, where the depth of water is never less than forty feet, where the current is slight, where there is comparatively little difficulty resulting from extreme high water, where there is never any ice and where conditions are far more favorable for navigation than they can ever be made between St. Louis and Baton Rouge, the interurban traffic by water has virtually ceased, because the railroads offer far better, quicker, safer and less costly means of transportation. Is it probable that the river business above Baton Rouge will ever grow larger in the face of constantly increasing and improving railroad facilities throughout the valley, and in the face of the construction and constant improvement of first-class, low-grade railroads, leading not only to Galveston, New Orleans, Gulfport, Mobile and Pensacola, on the Gulf, but also to Jacksonville, Brunswick, Savannah, Charleston, Wilmington and Norfolk, on the Atlantic Seaboard?

The aggregate amount of revetment work to be done is nowhere stated. There are now 39.6 miles of it below Cairo. To thoroughly protect the banks and stop the sloughing and undermining, it should extend along the river on one side or the other, a great part of the way from Cairo to the mouth of the Red River. The standard revetment consists of a mattress of willow, usually about 300 feet wide, extending from about low-water mark out into the river bed. Above

the edge of this mattress the bank of the river is graded back on a slope of one in three, and is then paved with stone, laid on a layer of spalls. The cost of construction is from $140,000 to $200,000 per mile. The cost of maintenance is about five per cent, and the work can be prosecuted only during three to five months each year, because of fluctuations in the water level.

A large portion of the expenditures hitherto made on the improvement of the Lower Mississippi (Cairo to New Orleans) have been made in building levees to protect the magnificent valley from destructive floods. That this money has been well and wisely invested, no reasonable or well informed man can for a moment doubt. Millions of acres of extremely valuable lands have been reclaimed and vast areas of most fertile alluvial plains brought under cultivation. The levees, however, have no effect whatever on the navigability of the river, and the estimates of cost that we have been considering, take no account of the future cost of extending, improving, or maintaining the levee system.

The height of the levees must of course, be increased as a larger and larger territory is reclaimed, over which the river could once spread its waters. It is asserted by some persons that the river bed is gradually rising along the portion thereof that has been leveed, and this result is said to have been noted in the leveed rivers of China, Italy, and other countries. The Chief of Engineers, however, asserts positively that there is no such result yet perceptible in the Mississippi River. Some persons have been deceived by the fact that there is in the bed of the river, a moving mass of silt, averaging about ten feet deep, which assumes, temporarily, different elevations, according to the effects of the varying currents.

It seems, however, that a fourteen-foot channel is to be but a "starter." Mr. Roosevelt, when President of the United States, declared, in a message to the Senate, that:

"The Mississippi should be made a loop of the sea, and the work upon it should be begun at the earliest possible moment. Deep channels along the Atlantic and Gulf Coast and from the Gulf to the Great Lakes will have high value for the national defense."

The mean draft of our largest war vessels is twenty-four feet, and the draft of the largest English vessels is certainly not less. We have no data as to the Japanese vessels. The St. Lawrence River and the

Welland Canal can not pass vessels drawing more than about thirteen and one-half feet of water. The St. Lawrence River is the boundary between New York State and Canada for about 110 miles. Since we are entirely at liberty to establish fortifications along the whole of this 110 miles, that could make navigation of the St. Lawrence impossible; since, in any event, vessels drawing more than thirteen and one-half feet of water cannot ascend the St. Lawrence River, and since we have already scores of big, steel-clad ore vessels, on the lakes, that could be quickly armed and adapted to military uses, if the British should decide to force us to take possession of Canada, it is hard to understand what vital and urgent necessity exists for a military use of Mr. Roosevelt's proposed "loop of the sea."

But it may be said, a canal twenty-two feet deep will be built through Canada from the Georgian Bay to Montreal, on which the larger war vessels might be towed to the Great Lakes.

Suppose such a canal were now in operation, and that we were in the thick of a fight with the English, does any one suppose that our adversary would be so utterly foolhardy as to send her great war vessels (every one of which would be needed to protect home and colonial coast cities and merchant marine) 1,000 miles along rivers and canals to Lake Huron? When there is not an important American city on the shores of that lake; when further progress would be barred by fortifications that would be quickly erected along the shores of the St. Mary's, St. Clair, and Detroit Rivers, and at the Straits of Mackinac; when a few sticks of dynamite exploded, by accident or otherwise, in one of the canal locks, would prevent retreat? Such suggestions seem puerile, if not idiotic.

But is there no danger of the Japanese attacking us on the lakes? There is the Gulf of California, the Colorado River, the proposed "Inland Waterway" across the crest of the Rocky Mountains, down the Missouri River and up the Mississippi and Illinois and Des Plaines, through the Drainage Canal, and the Chicago River to Lake Michigan. Our strenuous ex-President and his "Inland Waterways Commission" may be quaking over this terrible danger, but the rest of us will try to be calm and resign ourselves to our impending doom.

Chapter XVII.

THE UPPER MISSISSIPPI RIVER, THE BLACK WARRIOR RIVER, THE COLUMBIA RIVER AND SOME OTHER INLAND WATERWAYS.

"Experience keeps a dear school, but fools will learn in no other." Benjamin Franklin.

The reader would grow very weary, should we attempt to pursue the dreary and monotonous history of the failures made by the National Government in its efforts to tempt commerce from the railroads to the rivers. Over two hundred millions of dollars have been wasted, and yet, as Mr. Roosevelt truly says, "Our rivers are less serviceable for interstate commerce, to-day, than they were half a century ago, and, in spite of the vast increase in our population and commerce, they are on the whole less used."

There is still a small commerce, borne by primitive steamboats, on rivers that have not yet been closely paralleled by railroads; and, in remote forest regions, immense quantities of logs are thrown into the creeks and branches, and when they are at high stage, floated thence to saw mills on the lower reaches of the rivers. The building of locks and dams greatly interferes with the activities of the logging and lumbering industries, yet carefully kept statistics of the amount of such commerce are quoted constantly as an argument for investing millions of dollars in the building of similar obstruotions in the rivers.

Upper Mississippi River.

The distance from St. Louis to St. Paul, by water, is about 675 miles. There is probably nowhere on the globe a more magnificent country than that through which this reach of the beautiful river flows. St. Louis is a great and splendid city, with a population of close to three-fourths of a million souls. St. Paul and Minneapolis, at the head of navigation, probably have fully as many inhabitants. Rock Island and Davenport, on opopsite sides of the river, about half-way between

the cities first mentioned, are splendid, rapidly growing manufacturing centers. Hannibal, Keokuk, Burlington, Moline, Clinton, Dubuque, and La Crosse, all on the banks of the river, have become prosperous manufacturing cities, with great industries and factories. Into this section of the magnificent waterway empty great navigable tributaries—the Missouri, Illinois, Des Moines, Wisconsin and St. Croix. It flows along the borders of Missouri, Illinois, Iowa, Wisconsin, and Minnesota—five of the greatest, most populous, and prosperous states of the Union.

In Illinois, within a score of miles of the river, is one of the largest coal fields in the world, and the whole territory traversed is unsurpassed in fertility and in general prosperity.

This portion of the Mississippi River is now better adapted to the uses of inland commerce than are any of the rivers of Europe. Judge Ray S. Reid, Waterways Commissioner of the State of Wisconsin, recently visited all the important rivers of Europe, studied their conditions and commerce, and came back home to say of the Mississippi:

SAINT ANTHONY'S FALLS, MINNEAPOLIS, MINN.
The head of navigation, Mississippi River.

"I would like to say that, in my opinion, the Mississippi River, taken as a whole, from St. Paul to New Orleans, is in the best condition now, for the purpose of navigation, of any river in the world."

The Deep Waterways Board says:

"The immense commerce of the Rhine could be carried more readily and cheaply on the Mississippi to-day than on the Rhine."

Col. Townsend, an able and distinguished engineer of the Army Corps, says of this portion of the Mississippi:

"The obstacle at the Des Moines Rapids has been surmounted by a lateral canal. At the Rock Island Rapids, a channel has been ex-

VIEW OF LOCK AT MOLINE, ILL., UPPER MISSISSIPPI RIVER.

cavated through the rock composing the bed of the river, and the slopes modified by submerged dams and wing dams, as effectively as in the celebrated improvement of the Iron Gate on the Danube, etc., etc."

Between the end of the year 1878 and June 30, 1908, the National Government expended on the general improvements of the Mississippi, between St. Louis and St. Paul, $12,099,652.38. In addition to this, there has been invested in the Des Moines Rapids Canal $4,574,900, and $386,000.00 has been appropriated for work at Moline, Illinois—making a total investment of $17,060,552.38.

It is now estimated that the additional cost for securing a constant six-foot stage of water in the channel will be $20,000,000.00.

The annual cost of maintaining the open-work is about $50,000. The average annual cost of operating and maintaining the Des Moines Rapids Canal is $43,517.60, and $10,000 is to be expended annually at Moline—making a total operating charge of $103,517.60 per annum.

During the year 1907, the total commerce moved a short distance on the portion of the river between St. Louis and St. Paul, was 3,919,440 tons, and the ton-mileage is stated, in the report of the Chief of Engineers, to have been 532,899,222. The reports fail to give full

SCENE AT THE "PORT" OF KEOKUK, IOWA.
Just below the Des Moines Rapids Canal.

details of the classification of commodities, but state that it was chiefly logs, lumber, etc., that that commerce is of a temporary character, and that its volume is now rapidly declining . A few years ago, an immense quantity of this kind of tonnage was floated down as far as St. Louis; now but little of it goes below Davenport. In 1904, the total river commence was 4,534,539 tons, and this was carried far enough to give a total of 943,951,451 ton-miles. In four years the volume of commerce had declined by 615,099 tons, or fourteen per cent, and the distance over which the rafts, etc., have been floated has

been so greatly reduced that the ton-mileage has fallen off 411,052,229, or forty-six per cent.

For the costs of transportation by water on the Upper Mississippi in 1907, we have:

Interest on investment ($17,060,552) at 4%	$682,422.08
Annual cost of operation and maintenance	103,517.60
Total cost to the people of the Nation	$785,939.68

Of the total commerce, 2,003,061 tons (511,570,875 ton-miles) was composed of logs and rafted lumber, shingles, etc. which derived practically no benefit from the expenditures for river improvement. Of the balance, 1,519,581 tons (19,021,959 ton-miles) was miscellaneous freight, carried in boats. The remainder, 396,798 tons (2,306,388 ton-miles), was government construction materials used in making the improvements and, therefore, not in any sense "revenue freight." The railroads do not include the earth, stone, etc., that they haul in improving their lines, in their statements of "freight." The total "revenue freight" then, that was borne in boats, etc., on the river was 19,021,959 ton-miles.

It is probable that at least seventy-five per cent of this was floated on the river during periods when there would have been sufficient water had there been no "improvements" made; but, ignoring that phase of the subject, we have for the commerce of 1907 a cost of 4.1 cents per ton-mile, not including the tariff charges of the boats, which are said to be sixty-six per cent of the rail charges. It would be manifestly absurd to include in these computations the ton-miles of the log and lumber rafts that are floated on the river, chiefly during high water periods. That commerce is stated, by the Chief of Engineers, to be rapidly declining, and, indeed, fell off from 906,749,090 ton-miles in 1904 to 511,570,875 ton-miles in 1907—a decrease of forty-three per cent during a period of unexampled business prosperity. The reports show that the 1,519,581 tons of freight borne by the boats was carried an average distance of about 12.5 miles.

If we assume that even as much as one-half of this tonnage was floated on the river during the period of low water, and that it, therefore, actually did derive some benefit from the improvements that have been made, we have the following showing:

About 759,790 tons of mixed freight was carried on the water an average distance of about 12.5 miles, giving a ton-mileage of 9,510,980. This was done at rates .33 per cent below railroad rates, or at a saving of 0.253 cents, per ton, per mile. The **apparent** saving was, therefore, $24,062.78, and the cost to the people of the Nation was $785,939.68. If we ignore interest charges, we still have an actual annual outlay of $103,517.60 in maintaining the works which result in an apparent saving of less than one-fourth of the cost of such maintenance. We use the expression "apparent saving" advisedly, since, were it possible to ascertain the increased cost of hauling goods by wagon or dray, to and from the boats, up and down the muddy, slippery river banks; the damages and losses resulting from the constant uncertainty as to the time of arrival and departure of boats, people waiting

THE LONELY UPPER MISSISSIPPI RIVER AT QUINCY, ILL.
June 4, 1909.

This is said to be at this time, one of the best navigable rivers in the world, but the superiority of railroad facilities has taken practically all commerce from its waters.

hours on the river banks, exposed to the weather, and the many other dangers and inconveniences of the water transportation, it is probable that the apparent saving would be found to be as mythical and illusory as are all the statements and claims of the waterways advocates.

The $17,060,552 that have been wasted on this river improvement might have built a railroad from St. Louis to St. Paul (604 miles by rail) costing $28,000 per mile, with $148,554.00 to spare; and the $103,517.68 of annual maintenance cost would have paid nearly three-fourths of the rail rate tariff on the 19,021,959 ton-miles of freight and left only one-fourth thereof to be paid by the "dear people," in whose interests all these prodigal expenditures are supposed to be made.

The $20,000,000 which the agitators are now trying to force the government to waste in further "improvements" of this magnificent reach of waterway, would build a first-class railroad costing $40,000.00 per mile, from Omaha, via St. Louis, to Chicago, 480 miles, with $800,000 to spare.

Which would be the more beneficial to the Nation and her citizens? Which would be the more potent rate regulator—a railroad having no annual interest charges to meet, or a beautiful and picturesque river? When we find that the dangers, disadvantages and inconveniences of transportation on the latter are so great that the public cannot be induced to ship goods upon its waters, even while the government pays

UNITED STATES STEAMER "HENRY BOSEMAN" AT WORK ON "IMPROVEMENT" OF THE UPPER MISSISSIPPI RIVER.
June 5, 1909.

ninety per cent of the cost and the tariff rates are only sixty-six per cent of those of the land carriers, it would seem that even a "waterways crank" would be able to answer correctly.

Along both sides of this beautiful river, which is destined soon to be abandoned, except by pleasure seekers in excursion boats and launches, railroads have been built nearly the entire distance. These roads are practically level. Though they have taken the commerce from the river, yet there is not enough tonnage available to justify their owners in increasing their facilities by adding a second track, along either side of the water.

The agitators claim that low grade freight, such as coal, can be transported at far less cost by river than by rail.

The Mississippi River flows alongside of an immense coal field that extends throughout the length of the State of Illinois. The coal is being mined on a very large scale, and yet not a ton of the output is shipped by water, though there are great cities all along the river bank, using millions of tons of coal hauled to them by the railroads.

The ludicrous nature of the claims made for water transportation are most effectively realized, when one sees the dilapidated steamers that still ply on the river, sailing along near the edge of the coal fields and taking coal for their own engines from railroad cars on the bank; and the government boats and dredges, engaged in "improving" the river, taking their whole supply of fuel from coal cars,

SCENE IN DES MOINES RAPIDS CANAL.

Showing railroad cars loaded with coal awaiting transfer to Government boats, to be used in firing engines. Coal brought by rail from the Illinois coal field.

standing on special tracks alongside the ridiculous Des Moines Rapids Canal, and at other convenient railroad points between St. Louis and St. Paul.

No coal is borne on the river, but the Chicago, Burlington & Quincy Railroad is now improving and completing a nearly level railroad, from the Southern Illinois coal field to St. Paul and Minneapolis, on which a single engine will be able to haul about 5,000 tons of coal in a train weighing about 7,000 tons, at a cost of about two mills, per ton, per mile. This is something less than one-twentieth of the cost of transporting general merchandise on the river, even though we wholly ignore the charges made by the boats that carry the commerce.

There is an immense cement factory located on the right bank of the Mississippi River, a few miles below Hannibal ("Mark Twain's" birth-place) and about 120 miles above St. Louis. Some pictures of this great industrial plant are shown herewith, and it is seen that the great river flows alongside the works.

VIEW OF THE ATLAS CEMENT WORKS, NEAR HANNIBAL, MO. (MARK TWAIN'S OLD HOME.)

The railroads carry all the tonnage from and to this plant, though it is on the bank of the Mississippi, on which over $12,000,000 have been spent.

Although I had found much proof of the impracticability of handling freight by river, where there is railroad competition, yet I was astonished to find that not a ton of the output of this plant goes to

ILASCO LANDING, AT ATLAS CEMENT WORKS, NEAR HANNIBAL, MO.
June 4, 1909.
Compare with picture of railroad facilities.

market by water—not even to cities like St. Louis and Burlington that are located on the banks of the same great river. Yet, in spite of all these actual demonstrations of the impracticability of river and canal

transportation, we have innumerable advocates of immense government bond-issues, to secure funds to squander on the rivers! The newspapers are publishing leading editorials, advocating the bond-issue. Magazines are issuing special numbers, filled with false statements, garbled statistics, and ludicrous estimates. Great assemblages of men are being addressed by paid lecturers and orators, advocating such expenditures, and multitudes of honest and upright citizens are being deceived.

The gullibility of mankind is one of the most surprising characteristics of the race. Inasmuch as we are becoming an athletic people, one feels justified in suggesting that it were better to give the money to our valiant youth to "throw at the birds." That would, at least,

VIEW OF THE ATLAS CEMENT WORKS, NEAR HANNIBAL, MO.

All shipments to and from the works go by rail, though the Mississippi river flows along side thereof.

tend to develop muscle and brawn in the rising generation, and would leave them no lasting watery monuments to commemorate the folly of their fathers.

The Warrior River of Alabama.

The great Appalachian coal field extends northeast and southwest, parallel with the Appalachian Mountains, through Western Pennsylvania, West Virginia, Ohio, Kentucky, Virginia, Tennessee, and diagonally across the northern part of Alabama, from the northeast corner of the State to its central portion, finally disappearing near the junction of the Locust and Mulberry Forks of the Black Warrior River, a few miles above Tuscaloosa. The Alabama State Insane Asylum is located at Tuscaloosa, and the portion of the river above that institution is known as the Black Warrior River. The Warrior River empties

into the Tombigbee at Demopolis, and is, perhaps, between Tuscaloosa and Demopolis, a close rival of the famous **Meander**, for the honor of being the crookedest stream in the world. The little packet boat that occasionally essays the trip from Demopolis to Tuscaloosa (once a week, I think,) frequently runs its nose in the bank and has to back and "chasse" in order to pass around the "elbows" and "goose-necks" that are encountered. Within a mile, that river will appear bent on following Cook and Peary to the North Pole, and then it seems to empty its waters into either the Pacific or the Atlantic Oceans, but always you find, if you float with the current, that you are a few

BLACK WARRIOR RIVER, ALABAMA (HIGH WATER).

A straight reach, passing Tuscaloosa. Three locks and dams shown in the distance. The report of the Chief of Engineers states that the original depth of water is only 1 foot and the width of the river only 60 feet at some points far below Tuscaloosa.

miles nearer the Gulf of Mexico at dinner-time than you were at lunch or at breakfast. Between the pretty and attractive little city of Tuscaloosa and the town of Demopolis, there is scarcely a village or hamlet in sight, from the passing boats, and rarely even a residence—nothing but forest, with occasional clearings and log cabins. A railroad crosses the river at Tuscaloosa, another at Demopolis, and another about half way between those towns. Tuscaloosa had a popula-

tion of 5,094 in 1900, not including the Insane Asylum; Demopolis had 2,606. There are no other towns on the Warrior or Tombigbee Rivers, in the 425 miles of their total length.

There is no known mineral deposit between Demopolis and Tuscaloosa, and none between Demopolis and the mouth of the Tombigbee River, but in the little reach of river between Tuscaloosa and the confluence of the Locust and Mulberry Forks, the edge of the coal field is touched for a few miles, and here the Mobile & Ohio Railroad has a branch line along the bank of the stream. The little coal that is mined along the river bank, in those few miles, is handled by the railroad, which is between the river and the coal fields.

EXTREME HIGH WATER CONDITIONS. BLACK WARRIOR RIVER, AT TUSCALOOSA, ALA.

The depth of water at Demopolis is sometimes 60 feet, whilst at other times there is only one foot depth at many points between Tuscaloosa and Demopolis.

In the year 1887, the National Government undertook the construction of locks and dams in the Black Warrior River, with ostensible purpose of providing a six-foot navigable channel from Tuscaloosa and the Insane Asylum, up to the mouth of Daniels Creek, fourteen and one-half miles. In the twenty-two years between 1887 and 1909, locks and dams, numbers 10, 11, 12, and 13 have been built, giving a six-foot navigable channel along the twelve miles of waterway above Tuscaloosa. When lock and dam No. 14 shall have been completed, navigation

of a six-foot channel will be possible, up to Daniels Creek. Here there is accessible a very pretty pic-nic ground, and when the dream of the ancestors of the living generation shall have been realized, and the canalization of that fourteen and one-half miles of the **Black Warrior** shall be completed, it will be possible to take the lunatics from the asylum to the pic-nic ground, at the mouth of Daniels Creek, in boats.

A poet or philosopher might here find much to engender mournful reflections on the sad mutations of time and the vanities of human life—for, while the waterway was a-building, **an electric traction line has been put into service from the city, via the Insane Asylum, to the**

MOBILE AND OHIO RAILROAD.

Paralleling Black Warrior River, along edge of Alabama coal field above Tuscaloosa, Alabama.

pleasure resort, and now the lunatics, **from the Asylum,** travel by rail, and only those not yet incarcerated are interested in the further development of the waterway.

In March, 1907, the Congress passed a bill providing for the construction of locks, Nos. 14, 15, 16, and 17, at an estimated cost of $1,409,-000.00, leaving Nos. 18, 19, and 20, estimated to cost $1,047,000.00, yet unprovided for. If these ever be completed, the great State of Alabama will have, in the very heart of her territory, though somewhat remote from her centers of population, forty-six and one-half miles of beautiful swimming and boating pools. Coming generations of her youth may go out there by rail, from Birmingham and Bessemer, to enjoy

the great calm of the lonely waters, whilst exchanging vows of mutual and eternal fealty.

It is absolutely certain that no adequate commercial use can ever be made of these pretty, picturesque pools.

Last spring I made a trip, by packet boat, from Mobile to Tuscaloosa. Indeed, I went clear up to the "pic-nic" grounds, but I used the electric line for fourteen and one-half miles. The little old boat that I started on, having scarcely any cargo, her crew became disheartened, and turned back from Demopolis, but I waited patiently, and after thirty-six hours at Demopolis, another specimen of ancient waterways architecture arrived from Mobile. When I heard the whistle, I hastened from the hotel to the landing, lest I should get left. I got aboard, and paid my fare, at 10 o'clock at night—when I waked up the next morning I looked out again on the interesting town of Demopolis. About 10 o'clock in the forenoon, we got away from the landing, but not away from Demopolis. We "boxed the compass" for about two hours, and were again at Demopolis, but this time on the north side of the court house, instead of being at the landing on the south side thereof. Then the spry little boat ran her nose into the soft bank, backed away, charged at the muddy shore again, slowly veered around, and started northward, eastward, southward, and westward, by turns.

It is only fifty miles, "bee-line," between Demopolis and Tuscaloosa, but it took twenty-four hours to make the trip by water. There was little occasion for stops, except when we got out of fuel. On one such occasion the boat tied up to the bank, and the crew went ashore with axes, and the half-dozen passengers took "cat-naps" for two hours, while the captain and the mate rivaled each other in the use of eloquent and ornate expressions, derogatory to the characters of the score or more of lazy, ragged, stupid negro "roustabouts," who were hunting for dead trees and drift wood, chopping them up and bringing aboard the resulting fuel.

Finally, we did come in sight of Tuscaloosa. We sailed under the magnificent railroad bridge that spans the river, just as a fast train passed over, bound for New Orleans, and going thirty-five to forty miles an hour. The lower gate of lock No. 10 was out of order, or mud had collected in the lock chamber, so we had much trouble there, but we got to the landing after awhile. A little flat car, about six feet square, was run down the steep bank, by cable. The boat crew "discharged cargo" on the little car—some buckets of candy, a half-dozen chairs, and a few miscellaneous articles—perhaps a good wagon load;

and that was all. Then the car was pulled up the bank and I was advised that the "officers" were going up town for "refreshments," and that the boat would proceed through lock 12 in a few hours.

It was a most interesting experience, but if I ever again wish to go from Demopolis to Tuscaloosa, and am in a hurry, I shall walk or employ an ox-team, rather than try the waterway.

Previous to June 30, 1908, there had been invested in four locks and dams, above Tuscaloosa, $867,991.42 (Black Warrior River). The total cost for operation and care of the seven locks above Demopolis, in the year 1907, was $55,974.58; therefore, for the four above Tuscaloosa, we will take four-sevenths of that sum, or $31,985.48.

The statement of commerce given, includes the stone that is being taken down the river to build other locks and dams—a temporary tonnage which we will exclude from our computations.

The "revenue" commerce of the Black Warrior River, in 1907, was 91,676 ton-miles.

Interest on $867,991.42 at 4%	$34,719.65
Cost of operation and maintenance (1907)	31,985.48
Total cost to people of the Nation	$66,705.13

Cost per ton-mile was seventy-three cents, or ninety-six times the average cost of railroad transportation in the United States.

Attention has been called to the fact that, in addition to the sum already expended, an appropriation has been made to build locks and dams, Nos. 14, 15, 16, and 17, estimated to cost $1,409,000, and the scheme also contemplates building Nos. 18, 19, and 20, at an estimated cost of $1,074,000, though no rational man who has studied the subject can have any hope that the tonnage of commerce will be appreciably increased by extending the slack water to the junction of the two forks of this little river. The distance from Tuscaloosa to the forks, measured along the crooked river, is only forty-six and one-half miles, and there will have been expended on locks and dams, in that little space, $3,323,991.42, if indeed the estimates are not far exceeded, which almost invariably happens.

Then there will be eleven locks and dams, the maintenance and operation of each of which will cost about $10,000 per annum—a total charge against commerce, of $110,000 every year.

The interest on the investment will be not less than $132,959.66, per annum, and the total cost, to the people of the Nation, $242,959.66.

The apology for all this waste is that when the work is completed, coal may be hauled, by rail, from the Birmingham territory to the river, there transferred to barges drawing five and one-half feet of water, and floated thence down the Black Warrior, the Warrior, the Tombigbee, and the Alabama River, 425 miles, to Mobile on the coast, and be there again transferred to ships and taken, by water, to New Orleans and other Gulf ports. That the folly of the proposition would make it worthy of the wildest inmate of the asylum, near the head of navigation, is evident.

The distance from the proposed site of lock No. 20 (which is about twenty-five miles south of Birmingham) to Mobile, by water, is about 425 miles. The distance from Birmingham to Mobile, via the Louisville & Nashville Railroad, is 277 miles, and from Birmingham to New Orleans it is 418 miles. **The distance, by water, from the forks of the Warrior River, in the canyon some twenty-five miles southwest of Birmingham, to Mobile, is almost exactly the same as the distance, by the Louisville & Nashville Railroad, from Birmingham, via Mobile, to New Orleans—140 miles beyond Mobile.**

The Louisville & Nashville Railroad hauls coal from Birmingham to New Orleans, over many steep grades, for $1.25 per ton, or at a rate of three mills per ton-mile. Before the agitation against the railroads had culminated in the panic of 1907, the Louisville & Nashville Company had made a survey and location of a **practically level** line, from the Birmingham coal territory, along the route of the existing track, via Mobile, to New Orleans, and had the agitators permitted the work to proceed, that Company would probably have been, even now, expending many millions of dollars in the improvements and grade-reductions that had actually been begun, and were in full progress, when the "Roosevelt Panic" of 1907 forced the cessation of all such work. When these improvements are completed, the Louisville & Nashville will probably be able to give a rate of about two mills per ton-mile on coal from Birmingham to New Orleans. That Company has spur lines, reaching throughout the Birmingham coal territory, and the rates mentioned will apply, from the mine tipples to the doors of the manufactories, in the cities along the Gulf.

It has been seen that when the slack-water system has been completed, for only 46.5 miles above Tuscaloosa, the annual cost for that little reach of water will be $242,959.66. That would, at two mills, per ton-mile, pay the railroad freight charges on 2,700,000 tons of coal, for a like distance—which is more than double the amount of coal now

going down the Ohio and Mississippi Rivers, collected from the whole coal territory penetrated by the Monongahela, Allegheny, Kanawha, Big Sandy, Kentucky, Green and Ohio Rivers. The total tonnage of coal passing Cairo, by water, in 1908, was only 1,031,154 tons.

If it were possible to conceive of conditions arising that would take as much as 50,000 tons of coal down the narrow, crooked Warrior River in a year, we would have a cost of $4.80 per ton for 46.5 miles of transportation, and that is nearly four times the present railroad cost for the 418 miles, from Birmingham to New Orleans.

Birmingham coal, "run of mine," now sells in New Orleans at $2.75 per ton. The $4.86 would pay the freight at present railroad rates for 1,620 miles. But when we consider that the slack-water system includes nine locks and dams, below Tuscaloosa, the cost of which will equal or exceed that of the eleven above the city; when we consider that all experience in West Virginia and Pennsylvania has proven that it is impracticable to haul coal any considerable distance from mines before depositing it in barges, because of the prohibitive cost of such transfer, and the destructive effects upon the coal; when we consider the great length and excessive crookedness of the little Warrior River, which, before the dams were built, was only sixty feet wide, at points far below Tuscaloosa; when we consider the dangers and difficulties of navigating Mobile Bay with shallow, open barges, when sloops and larger vessels have frequently been wrecked there by storms—we are able to see pretty clearly the ridiculously impracticable character of the scheme for taking coal from the Birmingham field to Mobile and beyond, by water.

If the slack-water improvement be ever completed, it is possible that some youthful visionary may try experiments in coal transportation by water, but it is certain that the experiment will at once demonstrate the folly of the attempt. It is exceedingly doubtful whether 50,000 tons of coal will ever be taken, in barge, down the Warrior River and on to Mobile. If it be done, the cost will probably make it the most expensive fuel ever used on the earth.

Columbia River.

Among the large number of disgracefully wasteful and ridiculous schemes for the distribution of the "pork-barrel" fund, perhaps the expenditures now being made in the Columbia River, near The Dalles, in Oregon, are entitled to pre-eminence. From the mouth of Snake

River, near Pasco, westward this river flows through a desert, for about 150 miles.

Speaking of this reach of the river, the Report of the Chief of Engineers, for 1908 says:

"Before the days of railroads, this stretch of waterways, in connection with the lower reaches of the Columbia and the portage roads at Celio and the Cascades, formed the main highway of commerce between Eastern and Western Oregon, and a large amount of navigation was carried on, for that time. This navigation continued until 1882, and was then practically suspended, owing to the paralleling of the river by the Oregon Railroad and Navigation Company's Railroad."

The railroad mentioned is now a link in the magnificent Harriman-Union Pacific trans-continental line. It closely parallels the south bank of the river all the way down to Portland, and in 1908, the total commerce on the water was only 7,776 tons. During the past three years, another immensely costly railroad (the Spokane, Portland & Seattle) has been built, by the Northern Pacific and Great Northern Systems, close along the north bank of the river, all the way from Pasco to Portland.

This is one of the best built railroads in America, and is practically level throughout the distance referred to. The only town worth mentioning on the whole river east of Portland, is The Dalles, which had a population of only 3,542 in 1900. The whole experience of the living generation, as to transportation in America, has proven conclusively that, under the conditions described, it will be impossible for river craft to compete with rail lines. Yet, in the face of all this, the government is proceeding to spend $4,900,000 on an eight-foot canal, eight and one-half miles long, with five locks, to pass commerce around the falls in the Columbia and The Dalles.

In addition to this marvelous folly, we find that another canal, that cost $3,819,139.73, has been built at the Cascades, to pass river commerce around a rapid. The maintenance of the latter canal, during the year 1907-08, cost $14,569.34, and 50,000 cubic yards of mud had then accumulated in the upper entrance, the removal of which was estimated to cost $14,000 additional.

The latter canal has been in operation ten years. The average amount of commerce passed has been 33,547 tons per annum. The average annual cost of operation, etc., has been $10,063.22.

Interest on investment ($3,819,139.72) at 4%	$152,765.59
Annual cost of operation	10,063.22
Total annual cost to the Nation	$162,828.81

It has, therefore, cost the people of the Nation $4.85 per ton, for every ton of commerce that has passed through this canal, eight and one-half miles, not to speak of the sums charged by the boats.

The $4.85 would have paid the railroad charges (0.76 cents) for hauling an average class of commodities 638 miles, and would probably have paid for hauling the class of commodities that actually **did pass** through the canal, close to 1,000 miles. The new railroad has now been put in operation, and the water traffic must rapidly decline. It is probable that, by the time the canal at The Dalles is completed, it will be found that the cost of floating a ton of sand or gravel through the two canals would pay for transporting a ton of grain half-way around the world.

Other Rivers.

We will make brief mention of some of our other canalized rivers.

Ten locks and dams are in operation in the Muskingum River. The cost of construction was $1,769,597.88. The cost of maintenance averages (three years) $54,332.80, and the cost to the people, aside from boat charges, is 8.13 cents per ton-mile—about twelve times the average rail rate.

Three locks and dams have been built in the Upper White River, in Arkansas. The total investment was $811,007.15, and the cost to the people of the Nation for the commerce on that portion of the river was, in 1907, 20.8 cents per ton-mile—twenty-five times that of the rail lines.

Twenty-eight locks have been built in "improving" navigation in the Fox River of Wisconsin. The total investment is $2,604,209.98. The cost per ton-mile was 11.39 cents in 1906—fourteen times the average railroad rate.

We will hastily review the history of "improvement" and of commerce on the New England "Inland Waterways."

The tonnage of commerce on the Connecticut River in 1890 was 1,095,000 tons. The government has expended $563,721.93 on improvements, and has deepened the channel, up to Hartford, from only seven

to eleven feet. In 1899, the commerce had declined to 700,000 tons, and in 1907, it had fallen to 485,704 tons—more than half of which was coal.

The commerce of the Kennebec River, in 1889, was 2,549,240 tons. The government has expended $487,850 on improvement work, and has deepened the channel from 3.5 feet to ten feet, at low tide, up to Augusta. The commerce declined to 714,199 tons in 1899, and to 329,583 tons in 1907.

The total commerce on the Penobscot River, in 1889, was 2,165,092 tons. The government has expended $268,908.69 on improvements, and has deepened the channel from six feet to eleven feet, at low tide. Commerce declined to 658,632 tons in 1899, and to 451,806 tons in 1907.

Lake and Ocean Harbors.

The history of government expenditures, on harbors, presents a striking contrast to that which we have been considering, of investments in "Inland Waterways." There is no possibility of any competition with railroads here, and the investments in deep harbors, and in costly piers, wharves and docks, where wisely located, are an unquestionable benefit to great multitudes of citizens, if not to the whole Nation. The government had expended, prior to June 30, 1908, $7,187,-838 on Boston Harbor, and in a period of about fifteen years, the commerce there has been increased from 9,650,000 tons to 17,000,000 tons.

$1,851,348 have been expended on the Providence Harbor, and in a period of about fifteen years, the commerce of that port has increased from 1,305,000 tons to 3,128,000 tons.

$1,467,500 have been expended on Harlem River, at New York City, and the commerce has increased from 3,002,000 tons to 9,656,000 tons in about fifteen years.

$5,506,000 have been expended on New York Harbor, and in fifteen years the commerce has grown from 43,500,000 tons to 80,000,000 tons.

$8,583,000 have been expended on Delaware River and Philadelphia Harbor, and the commerce grew from 13,121,000 tons to 26,250,000 tons in fifteen years.

$1,854,000 have been expended on Norfolk Harbor, and commerce has grown in fifteen years from 2,180,000 tons to 13,406,000. This is one of the most astounding increases in the world.

$8,018,600 have been expended on Savannah Harbor, and commerce has increased from 2,000,000 tons to 3,885,000 tons.

$5,413,400 have been expended on the Duluth Harbor in Lake Superior, and in fifteen years commerce has gone from 3,527,000 tons to 28,877,000 tons.

$2,520,700 have been expended on the Toledo Harbor, and commerce has increased from 1,472,000 to 4,404,000 tons.

$1,247,200 have been expended on the Ashtabula Harbor (Lake Erie), and the commerce has increased from 2,796 tons to 10,466,000.

$5,268,500 have been expended on the Buffalo Harbor, and the commerce has grown from 4,248,000 to 12,179,000 tons.

$2,873,300 have been expended in improving the Oakland (San Francisco) Harbor, and commerce has grown from 152,000 to 1,292,000 tons.

The Columbia and Willamette Rivers have been improved up to Portland Harbor, giving twenty-two feet of water, at a cost of $1,769,500, and commerce has increased from 1,613,000 tons to 3,680,000 tons.

No reasonable man can question the wisdom of such expenditures, when such magnificent results are shown. Every patriotic citizen should advocate the improvement of our Lake, Gulf and Deep Sea Harbors, and those tidal rivers on which great cities are located, but these things can supply no apology for the reckless waste of public funds on the shallow, crooked, ever-varying rivers of the interior.

Chapter XVIII.

THE RAILROADS.

"O mighty power of steam and rail, I bow to thee! I recognize thee as the most marvelous agent of civilization, by annihilation of time and distance, that the world has ever known! I give thee full credit for all thy deserts, which are incalculably important and without which our modern world could not exist!"—J. E. Ransdell, President of the National Rivers and Harbors Congress.

We have been studying the conditions that limit inland waterway transportation, and have found that commerce on rivers thrives until it encounters railroad competition—then Nature's law, "the survival of the fittest," destroys the river traffic.

Seventy years ago a similar contest was fought out, on our rivers, between the primitive flat and the keel-bottomed boats and the intruding steamers—the "fittest" survived and must always do so, unless progress be retarded by the folly of man.

To-day steam and electric railway lines are incomparably superior to any other known means of inland transportation. The steam-packet boat may still aid the beginning of development in remote regions, but must give place when the railroad locomotive and car appear on the scene. To try to prevent such a consummation, because of any sentimental considerations, is utterly childish.

A comparison between rail and inland water transportation reveals the infinite superiority of the former, and the impossibility of successful competition on the part of the latter. Mr. M. H. Smith, President of the Louisville & Nashville Railroad Company, has tersely stated the conditions, as follows:

"A moment's consideration should show why railway transportation, as provided in this country, is, and should be, preferred to water transportation. People do not have their habitations on the ocean, and but a small portion along the navigable waters. Inland waterway transportation is subject to many contingencies—floods, ice, fogs, low water, and routes are indirect. Rail transportation operates continuously, usually follows shortest line between given points, reaches their homes,

warehouses, manufactories, forests, mines, whether located in the valleys or on the mountains, and the large mass must, therefore, depend upon railroad facilities. This is inadvertently admitted by Mr. Roosevelt, when he states that 'comparatively little inland freight is carried by boat which is not carried part of its journey by rail also,' and the fact that the 'railways, with their convenient terminals,' give 'quicker and more satisfactory service' would seem to be ample reason for preference of rail transportation between all points reached by such facilities, and also the reason why even the smallest of communities located along the banks of navigable rivers desire, in addition, rail transportation facilities, and are willing to and do make sacrifices to obtain them."

When the railroads were in their swaddling clothes they were able to give transportation facilities so far superior to those afforded by the canals and rivers that the latter were forced out of business. Since then the railway lines have grown vastly stronger, though still in a state of adolescence. Already they have performed wonderful feats and infinitely enriched the Nation and benefited its citizens. Already the locomotive burrows through mountains, climbs the sides of ridges and plateaus, crosses at dizzy heights, ravines, canyons and wide valleys, rushes in perfect safety under or over deep and wide rivers, swamps and lakes, propels stupendous loads of heavy freight along the smooth valleys, and reaches out with spurs and branches to the forests and mines far up on the steep sides of lofty mountains. Already the railroad train serves the citizens of great cities with lines of transportation, **on the surface of the ground, under their habitations, and up in the air above their heads.** Already the rail lines provide passenger service that is swifter than the flight of the eagle and yet less hazardous than the ancient stage coach. Already dining and sleeping cars are supplied with every comfort and luxury, and yet the cost of travel has been reduced far below anything that our ancestors dreamed of, when toiling painfully from place to place on horse-back, or in slow stage coaches. Already the American railroad transports the goods of the citizens at rates far lower than is found possible anywhere else in the world.

Though all this, and much more, has been accomplished, yet we have but begun. Strong, intellectual men have the management of most of the properties; they constantly press into service every able man whom they can discover. The service is being steadily strengthened and systematized. Every invention is carefully considered and

every possible scientific discovery is quickly utilized. It is true that traffic did grow faster, during a few recent years, than the managers of the railways had anticipated, and so they were temporarily embarrassed with more business than they could handle promptly, but when we remember that four or five times as much traffic may be handled on a double track road as on one having but a single track; when we remember that three times as much tonnage may be propelled by a locomotive on a three-tenths per cent grade as on the ordinary 1.5 per cent grade, and when we remember that the power of locomotives and the capacity of cars are steadily being increased, it may be readily perceived that the current talk about a necessity for returning to primitive waterway transportation, because of the inability of rail lines to handle the traffic, is mere childish prattle. Railroad transportation development in America is not circumscribed by physical laws, but by human folly. The possibilities of development and efficiency are limited only by the popular will, and such development is now retarded solely because of popular misconception and mean jealousies, for which the demagogues alone are responsible.

The waterways cannot possibly afford any appreciable relief, because they do not flow in the direction of traffic, do not penetrate many regions in which traffic originates, nor flow to the points where materials are required; because they are circuitous and indirect; because they are often inaccessible and always unreliable; because they give slow service, surrounded by dangers and inconveniences; because they cannot put forth branches into adjacent territory, but are confined to crooked, shifting channels, with possibilities forever limited within narrow bounds by the laws of Nature; and because economic interchange of traffic, between rail lines and waterways, is rendered impossible by laws that no man can modify or control.

In closing this discussion it seems well to quote from the "thorough, conservative, sane, and just" report of the Board of Engineers for Rivers and Harbors (See pages 113-114, House Document No. 492, 60th Congress, 1st Session). The reasoning may be justly applied to all river improvement, though only intended to refer to the Ohio River:

"Nor does the Board consider that the saving which would accrue to existing commerce by the proposed improvement would be sufficient to justify its cost. In fact, the losses claimed to be sustained by the coal interests, due to delays in shipment, under existing conditions, are less than one-half the cost of maintaining the proposed waterway, and it is believed that as much coal is now shipped by water as there is

a demand for on the lower rivers. A material increase in the commerce of the river must, therefore, be created by the improvement and a change in the character of the freight carried to warrant such an expenditure. Nor is the Board prepared to indorse fully the views expressed as to the benefits to be derived from river transportation over that of rail. Railroads possess certain inherent advantages, which compensate in great measure for the cheapness with which freight can be moved by water. The railroad companies have become the great agencies for transportation in this country. They have connected the principal towns with cheap lines of communication, penetrating the field, the mine, the factory and the warehouse. They have expended large sums in developing their terminal facilities in the various cities through which they pass, and have erected elevators and other auxiliaries to reduce terminal charges. By consolidating into vast trunk lines, the cars collected by the branches are moved long distances in train-load lots with great economy.

"Lines of river transportation are restricted in location. They must follow the thalwegs of the larger valleys, and can penetrate only a small part of the country. Except in case of the comparatively few mines and factories which are situated on their banks, it is necessary to transport by car or wagon from the shipping point to the waterways, and then trans-ship and reverse these operations to reach the terminal, while the railroad can ship from the mine to the factory or warehouse without breaking bulk.

"Branch lines by rail or wagon are a necessity to an efficient water route. But in determining the cost of transportation by water, the cost of these lateral feeders is not usually considered, while it forms a large percentage of the cost of rail transportation.

"On the main lines of the various railway systems, freight is being transported in train-lots at a rate of less than two mills per ton-mile, and it is natural for the railroads to endeavor to reap the benefits of a long haul and not surrender the most profitable portion of their trade to a rival water route. It would be unreasonable to expect them to act as feeders to a water route at a rate per ton-mile the same as they now charge for carrying freight from New Orleans to Pittsburg in competition with it, nor can they be compelled to turn over to rival carriers their warehouses, elevators, and other terminal facilities which they have erected at great expense.

"Distances by rail are considerably shorter than by river, which compensates to a certain extent for their greater rate per ton-mile. A short water route cannot successfully compete with a great railway system for through commerce. To be a success it must be of such a length that the great transportation companies will themselves find it advantageous to ship over it.

"The waterways connecting the Great Lakes have enormously developed in the past ten years, but the railways have reaped the benefits. Neither the Canadian canals down the St. Lawrence River, nor

the Erie Canal across New York State have responded to the growth of the lake commerce. The success of the Great Lakes as a means of transportation has not resulted from competition between the great systems of transportation and outside parties, but from the utilization of the waterway by the railroads themselves, which have expended millions of dollars to improve their terminal facilities and have established the large fleets which navigate the lakes.

"But the great cause of the failure of waterways as a means of transportation in the United States is that they heretofore have not generally followed a commercial route, but have led from nowhere to no place. The river systems of the country flow generally in the southerly direction, while the trend of commerce has been East and West. Until within the last ten years a railroad running North and South was generally a financial failure. River systems have followed the same laws, their commerce has been confined to the products on their immediate banks, and that of not sufficient amount to justify their permanent improvement."

This is the mature judgment of the men who constituted the National Board of Engineers for Rivers and Harbors, in the year 1907. They are all able and distinguished engineers, who have devoted their lives, in large measure, to the construction, operation, and maintenance of waterways improvement, and to a study of ways and means for their betterment. Shall we oppose to this the opinions of a political commission, composed of a farmer, a forester, an anthropologist, an hydrographer, and some lawyers, who went on a pleasure trip for a few weeks, and after that junket, undertook to express opinions about "Transportation," "Commerce," "Navigation," "Sanitation," "Conservation," and about the "manner and means of attacking" problems that the ablest engineers and scientists of the world have vainly tried to solve?

Chapter XIX.

CONCLUSION.

"Had we not better face about and go back to sane regulation, which, under general laws, will leave to the railroad manager a free field and an unfettered hand?"—Theo. Shonts, formerly President Isthmian Canal Commission.

The investigations made lead inevitably to the following conclusions:

First. The development of the best possible transportation facilities is essential to the greatest possible progress and prosperity of the human family. The Nation having the best facilities for transporting and marketing its products will lead the world in the march of progress, irrespective of natural resources or other conditions.

Second. The demagogues, muck-rakers, and agitators who checked the development of the American transportation system are our worst national enemies.

Third. The conservation schemes, now advanced by the agitators, by means of re-forestation and reservoir construction, in the interests of inland navigation, are, in the main, preposterous or impossible.

Fourth. The construction of canals, less than twenty feet deep, is a waste of money, no matter where they may be built, and the construction of canals twenty feet deep, or over, is of doubtful expediency—only likely to justify the immense expenditure always required where they are quite short, and where they connect large bodies of navigable water on which a great commerce has already been established.

Fifth. The canalization of American rivers always involves expenditures that are wholly without justification; always involves a disgraceful waste of public revenue, and frequently involves a shameful traffic between officeholders and their constituents, whereby the Nation is betrayed and her citizens debauched. The era of economic river navigation has passed and cannot be restored, except by enforcing reactionary laws that would result in staying the progress of civilization. Such laws are impossible of enforcement under the American Constitution.

Sixth. The expenditure of from seventy-five to one hundred million dollars on the canalization of the Ohio River cannot be justified under modern transportation and general economic conditions; involves much injustice to coal owners and operators in over nine-tenths of our whole coal territory; involves a cost wholly out of proportion to any possible resulting benefits; involves a tremendous national expenditure, burdening the whole people of a great Nation, when seventy per cent of all the benefits are monopolized by one large coal trust that is already earning immense profits and returning little to the Nation in taxes; and is certain to be found useless and worthless when the coal of the small accessible territory has been exhausted.

Seventh. The improvement of the Illinois and Des Plaines Rivers is wholly without justification, as a national project, since the sole beneficial result (having any bearing upon the popular welfare) likely to follow is the disposal of Chicago sewage in such manner as to free that city from the payment of damages to property owners along the rivers mentioned, if she ever be permitted to divert from Lake Michigan as much as 10,000 or 14,000 cubic feet of water per second. Water-power development has no connection with questions of national polity.

Eighth. It is impossible to improve the Mississippi River between Cairo and the Gulf so as to give a constant twenty-four-foot depth. The river would not be used to any considerable extent if such depth were possible, because of natural laws that forbid it. A fourteen-foot maintained depth may be possible, but it is wholly impracticable, because there is not enough traffic to justify one-hundredth part of the cost thereof. Such a depth, even in slack water, would not induce any considerable growth of traffic, because it is too shallow for profitable navigation by sea-going ships. With the currents encountered in the Mississippi River between Baton Rouge and Cairo, it would be impossible for sea-going vessels to navigate a crooked channel only 250 feet wide, or even double that width.

Ninth. Our only possible recourse, under economic conditions existing in America, is to be found in building more railroads and better railroads; in encouraging capitalists to invest largely in railroad securities, by enacting just laws; in encouraging brainy men to manage railroads, by giving them full control of the properties, and allowing them large liberty in the management thereof; in using every possible means for discouraging dishonest demagogues and political agitators, and in freeing the transportation systems from danger of further injury from such people.

TABULATED STATISTICS, COMPARING GROWTH OF GERMANY AND THE UNITED STATES—1880 TO 1905.

APPENDIX NO. 1.

	United States, 1880	Germany, 1880	United States, 1905	Germany, 1905	Increase in the U. S.	Increase in Germany	Decrease
Population	50,155,783	45,194,172	85,000,000	60,641,278	34,844,217	15,447,106	
Value total Imports	$ 696,805,867	$ 674,872,800	$1,117,513,071	$1,769,830,594	$ 420,707,204	$1,094,957,794	
Value total Exports	$ 875,560,802	$ 724,971,800	$1,491,744,641	$ 914,352,446	$ 616,183,839	$ 189,380,646	
Imports of Specie	$ 85,275,723	$ 9,710,400	$ 81,133,826	$ 67,614,372	----------	$ 57,903,972	$4,141,897(U.S.)
Exports of Specie	$ 17,142,199	$ 12,685,400	$ 141,442,836	$ 24,927,882	$ 124,300,637	$ 12,242,482	
Total length railways	93,267	20,627	217,341	35,235	124,074	14,608	
Domestic animals	120,989,300	51,266,042	173,679,253	50,426,810('04)	52,689,953	----------	839,232 (Germany)
National Debt	$2,120,415,370	$ 57,900,467	$2,274,615,064	$ 719,593,000	$ 154,199,694	$ 661,692,533	
Coal Production	73,647,997 t	48,700,000 t	392,919,341 t	121,298,167 t	319,271,344 t	72,598,167 t	
Grain Production ‡	69,454,801 t	12,787,000 ‡t	111,873,660 t	22,776,000 ‡t	42,418,859 t	9,989,000 ‡t	
Pig Iron	3,897,480 *t	2,792,038 *t	23,340,258 *t	10,987,623 *t	19,442,778 *t	8,195,585 *t	
Steel	1,267,700 *t	660,591 *t	20,354,291 *t	10,066,553 *t	19,086,591 *t	9,405,962 *t	

*Metric Tons.
‡Germany, Rye, Wheat, Barley and Oats.

APPENDIX No. 2.

Tabulated Statistics of Actual and Estimated Cost of Canalizing the Ohio River and Some of its Tributaries.

Canalized Rivers.	Cost of Construction.	Length Miles	No. of Locks	Depth Feet	Location.
Allegheny Expended and estimated........	$1,658,226 63	25	3	5	Mouth to Tarentum, Pennsylvania.
Monongahela (exp. and est.)	7,345,857.55	128½	15	Below Morgantown 4′ to 6′ above 7′	Pittsburg, Pa., to Fairmont, W. Va.
Kanawha (exp. and est.)	4,271,863.14	90	10	6	Point Pleasant to Loup Creek Shoal.
Big Sandy (exp. and est.)	1,205,954.50	40	3	6	Catlettsburg to Louisa, Ky. and Salt Peter, W. Va.
Kentucky (exp. and est.)	2,903,309.92	226	11	5½	Lock No. 1 to Irvine, Ky.
Ohio	76,919,122.90	962	54	9	Mouth to Pittsburg.

Total cost $94,304,334.64
Total length 1471.05
Average cost per mile $64,087.22

APPENDIX No. 3.

Dimensions and Cost of American Canals.

Canals	Cost of Construction	When Completed.	Length Miles	No. of Locks.	Depth Feet.	Location
Albermale and Chesapeake --	$ 1,641,363	1860	44	1	7½	Norfolk, Va., to Currituck Sound, N. C.
Augusta--------	1,500,000	1847	9	------	11	Savannah River, Ga., to Augusta, Ga.
Black River----	3,581,954	1849	35	109	4	Rome, N, Y., to Lyons Falls, New York
Cayuga and Seneca -------	2,232,632	1839	25	11	7	Montezuma, N. Y. to Cayuga and Seneca Lakes, N. Y.
Champlain -----	4,044,000	1819	66	32	5	Whitehall, N. Y. to West Troy, N. Y.
Chesapeake and Ohio ----	11,290,328	1850	184	73	6	Cumberland, Md., to Washington, D. C.
Chesapeake and Delaware	3,730,230	1829	14	3	9	Chesapeake City, Md., to Delaware City, Del.

APPENDIX No. 3—Continued.
Dimensions and Cost of American Canals.

Canals	Cost of Construction	When Completed	Length Miles	No. of Locks	Depth Feet	Location
Companies	$ 90,000	1847	22	1	6	Miss. River, La., to Bayou Black, La.
Delaware and Rariton	4,888,749	1838	66	14	7	New Brunswick, N. J., to Trenton, N. J.
Delaware Division	2,433,350	1830	60	33	6	Easton, Pa., to Bristol, Pa.
Des Moines Rapids	4,574,950	1877	7½	3	5	At Des Moines, Rapids, Miss. River.
Dismal Swamp	1,151,000	1794	29	7	6	Elizabeth River, Va., to Pasquotonk River, N.C.
Erie Canal	51,619,203	1825	351.78	------	7	Albany, N. Y., to Buffalo, N. Y.
Est. to Enlarge	101,000,000	------	------	------	12	
Galveston and Brazos	340,000	1851	38	------	3½	Galveston, Texas, to Brazos River, Texas.
Illinois and Michigan	7,357,787	1848	96	18	5½	Chicago River, Ill., to La Salle, Ill.

APPENDIX No. 3—Continued.
Dimensions and Cost of American Canals.

Canals	Cost of Construction	When Completed	Length Miles	No. of Locks	Depth Feet	Location
Illinois and Mississippi	$ 7,494,534	------	104	33	7	From Hennepin on the Illinois River to Rock Island on the Miss. River.
Hocking	975,481	1843	42	26	4	Carroll, Ohio to Nelsonville, Ohio.
Lehigh Canal and Navg. Co.	4,455,000	1821	48	57	6	Coalport, Pa. to Easton, Pa.
Louisville and Portland	5,578,631	1872	2½	2	------	At falls of Ohio River, Louisville, Ky.
Miami and Erie	8,062,680	1835	250	97	4	Cincinnati, Ohio to Toledo, Ohio.
Morris	6,000,000	1836	103	33	5	Easton, Pa., to Jersey City, N.J.
Muscle Shoals Elk River Sh.	3,191,726	1890	16	11	5	Big Muscle Shoals, Tenn., to Elk River Shoals, Tenn.
Ogeechee	407,818	1840	16	11	6	Savannah River, Ga., to Ogeechee River, Ga.

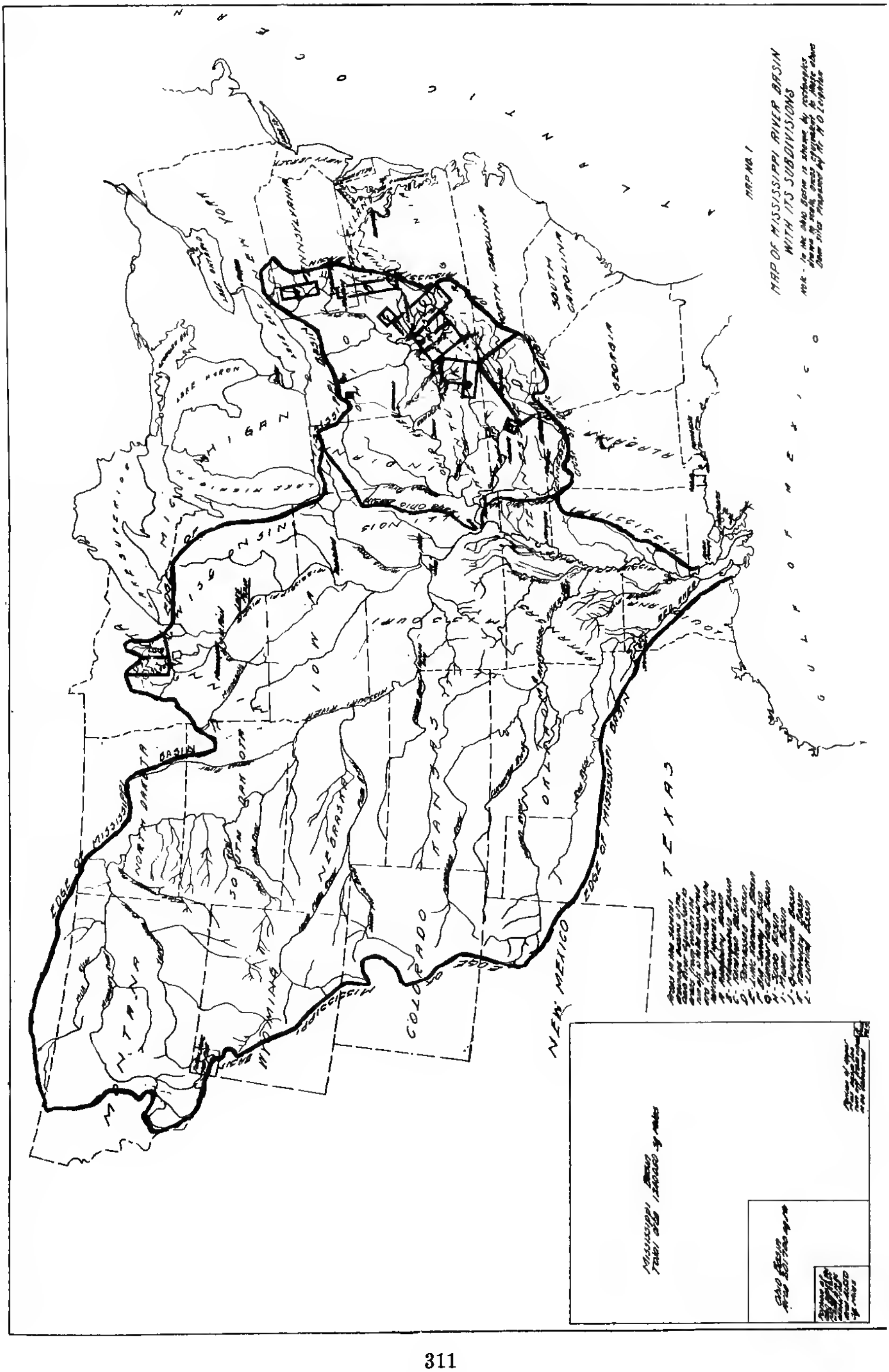
APPENDIX No. 3—Continued.
Dimensions and Cost of American Canals.

Canals	Cost of Construction	When Com-pleted	Length Miles	No. of Locks	Depth Feet	Location
Ohio ----------	$ 4,695,204	1835	309	144	4	Cleveland, Ohio to Portsmouth,Ohio
Oswego --------	5,239,526	1828	38	29	7	Oswego, N. Y. to Syracuse, N. Y.
Pennsylvania ---	7,731.750	1839	249	29	7	Columbia, North-Cumberland to Wilkesbarre, Huntingdon, Pa.
Santa Fe -------	70,000	1880	10	------	5	Waldo, Florida to Melrose, Florida.
Schuylkill Navigation Co.----	12,461,600	1826	108	71	6¼	Mill Creek, Pa., to Philadelphia, Pa.
Sus. and Tide-water --------	4,931,345	1840	45	32	5½	Columbia, Pa., to Havre de Grace, Md.
Walhonding ----	607,269	1843	25	11	4	Rochester, Ohio to Roscoe, Ohio.
Chicago Drainage Canal ----	55,000,000	Not Com-pleted	30	1	24	Chicago, Illinois to Joliet, Illinois.

APPENDIX No. 3—Continued.
Dimensions and Cost of American Canals.

Canals	Cost of Construction	When Completed	Length Miles	No. of Locks	Depth Feet	Location
Panama	$*400,000,000	Not Completed	49.00	8	29½	Between Caribbean Sea and Pacific Ocean.
St. Mary's Falls	6,033,533.00	1896	1.60	1	21	Between Lake Superior and Lake Huron.
Sault St. Marie	4,639,180.62	1895	1.12	1	21	Between Lake Huron and Lake Superior.
Welland	27,275,869.40	1900	26.75	26	14	Between Lake Erie and Lake Ontario.
Lachine	11,597,750.78	1901	8.50	5	14	Montreal to Lachine.
Cornwall	7,224,284.70	1900	11.00	6	14	Cornwall to Dickenson's Landing.
Soulanges	6,904,683.58	1890	14.00	5	14	Coteau Landing to Cascades.
Farron's Point (Enlargement)	877,090.57	1900	1.50	1	14	From Farron's Point, a mile Westward.
Rapide Plat (Enlargement)	2,158,242.00	1897	3.37	2	14	From Morrisburg, Westward.
Galops (Enlargement)	6,006,626.92	1903	7.33	3	14	St. Lawrence River
Murray	1,248,820.26	1890	5.67	------	14	St. Lawrence River
Williamsburg	1,331.351.80	------	1.50	1	14	St. Lawrence River
St. Peters	684,547.14	1881	0.45	1	19	St. Lawrence River

*Estimated.


MAP NO. 1
MAP OF MISSISSIPPI RIVER BASIN WITH ITS SUBDIVISIONS
EDGE OF MISSISSIPPI BASIN
TEXAS
NEW MEXICO
COLORADO
KANSAS
NEBRASKA
SOUTH DAKOTA
NORTH DAKOTA
SOUTH CAROLINA
NORTH CAROLINA
GEORGIA
LAKE HURON
LAKE MICHIGAN
LAKE ONTARIO
LAKE SUPERIOR
GULF OF MEXICO